Surface Mount Multilayer Ceramic Chip Capacitors (SMD MLCCs)

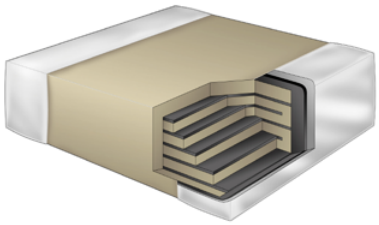
High Voltage X7R Dielectric, 500VDC–3000VDC (Commercial & Automotive Grade)

Overview

KEMET's high voltage surface mount MLCCs in X7R dielectric feature a 125°C maximum operating temperature and are considered "temperature stable." The Electronic Industries Alliance (EIA) characterizes X7R dielectric as a Class II 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 ±15% from -55°C to +125°C.

Available in a variety of case sizes and industry-leading CV values (capacitance/voltage), these devices exhibit low leakage current and low ESR at high frequencies. Conventional uses include both snubbers and filters in applications such as switching power supplies and lighting ballasts. Their exceptional performance at high frequencies has made high voltage MLCCs the preferred dielectric choice of design engineers worldwide. In addition to their use in power supplies, these capacitors are widely used in industries related to automotive (hybrid), telecommunications, medical, military, aerospace, semiconductors and test/diagnostic equipment.

Automotive Grade is available for applications requiring proven, reliable performance in harsh environments. Whether under-hood or in-cabin, these capacitors are designed for mission and safety critical automotive circuits. Stricter testing protocol and inspection criteria have been established for Automotive Grade products in recognition of potentially harsh environmental conditions. KEMET Automotive Grade series capacitors meet the demanding Automotive Electronics Council's AEC-Q200 qualification requirements and are manufactured in state-of-the-art ISO/TS 16949:2002 certified facilities.



Ordering Information

C	1210	C	154	K	C	R	A	C	TU
Ceramic	Case Size (L" x W")	Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Dielectric	Failure Rate/ Design	Termination Finish[1]	Packaging/Grade (C-Spec)[2]
	0805 1206 1210 1808 1812 1825 2220 2225	C = Standard	2 Sig. Digits + Number of Zeros	J = ±5% K = ±10% M = ±20%	C = 500V B = 630V D = 1000V F = 1500V G = 2000V Z = 2500V H = 3000V	R = X7R	A = N/A	C = 100% Matte Sn L = SnPb (5% min)	Blank = Bulk TU = 7" Reel Unmarked TM = 7" Reel Marked AUTO = Automotive Grade 7" Reel Unmarked

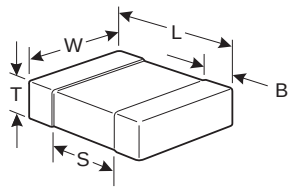
[1] *Additional termination finish options may be available. Contact KEMET for details.*

[1, 2] *SnPb termination finish option is not available on Automotive Grade product.*

[2] *Additional reeling or packaging options may be available. Contact KEMET for details.*

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Dimensions – Millimeters (Inches)



EIA Size Code	Metric Size Code	L Length	W Width	T Thickness	B Bandwidth	S Separation Min.	Mounting Technique
0805	2012	2.00 (.079) ± 0.20 (.008)	1.25 (.049) ± 0.20 (.008)	See Table 2 for Thickness	0.50 (0.02) ± 0.25 (.010)	0.75 (.030)	Solder Wave or Solder Reflow
1206	3216	3.20 (.126) ± 0.20 (.008)	1.60 (.063) ± 0.20 (.008)		0.50 (0.02) ± 0.25 (.010)	N/A	
1210	3225	3.20 (.126) ± 0.20 (.008)	2.50 (.098) ± 0.20 (.008)		0.50 (0.02) ± 0.25 (.010)		Solder Reflow Only
1808	4520	4.70 (.185) ± 0.50 (.020)	2.00 (.079) ± 0.20 (.008)		0.60 (.024) ± 0.35 (.014)		
1812	4532	4.50 (.177) ± 0.30 (.012)	3.20 (.126) ± 0.30 (.012)		0.60 (.024) ± 0.35 (.014)		
1825	4564	4.50 (.177) ± 0.30 (.012)	6.40 (.252) ± 0.40 (.016)		0.60 (.024) ± 0.35 (.014)		
2220	5650	5.70 (.224) ± 0.40 (.016)	5.00 (.197) ± 0.40 (.016)		0.60 (.024) ± 0.35 (.014)		
2225	5664	5.60 (.220) ± 0.40 (.016)	6.40 (.248) ± 0.40 (.016)		0.60 (.024) ± 0.35 (.014)		

Benefits

- -55°C to +125°C operating temperature range
- Industry-leading CV values
- Exceptional performance at high frequencies
- Pb-Free and RoHS compliant
- EIA 0805, 1206, 1210, 1808, 1812, 1825, 2220 and 2225 case sizes
- DC voltage ratings of 500V, 630V, 1KV, 1.5KV, 2 KV, 2.5 KV and 3 KV
- Capacitance offerings ranging from 10pF to 0.33µF
- Available capacitance tolerances of ±5%, ±10% and ±20%
- Low ESR and ESL
- Non-polar device, minimizing installation concerns
- Commercial and Automotive (AEC-Q200) Grades available
- 100% pure matte tin-plated termination finish allowing for excellent solderability
- SnPb plated termination finish option available upon request (5% minimum)

Applications

Typical applications include switch mode power supplies (input filters, resonators, tank circuits, snubber 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 (electric and hybrid vehicles, charging stations and lighting) applications.

Application Note

X7R dielectric is not recommended for AC line filtering or pulse applications.

Qualification/Certification

Commercial Grade products are subject to internal qualification. Details regarding test methods and conditions are referenced in Table 4, Performance & Reliability.

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.

Environmental Compliance

Pb-Free and RoHS compliant (excluding SnPb termination finish option)

RoHS Compliant

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 (Max % Cap Loss/Decade Hour)	3.0%
Dielectric Withstanding Voltage	150% of rated voltage for voltage rating of < 1,000V 120% of rated voltage for voltage rating of ≥ 1,000V (5 ± 1 seconds and charge/discharge not exceeding 50mA)
Dissipation Factor (DF) Maximum Limit @ 25°C	2.5%
Insulation Resistance (IR) Limit @ 25°C	See Insulation Resistance Limit Table (500VDC applied for 120 ± 5 seconds @ 25°C)

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

1kHz ± 50Hz and 1.0 ± 0.2 Vrms if capacitance ≤10μF

120Hz ± 10Hz and 0.5 ± 0.1 Vrms if capacitance >10μF

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					
Dielectric	Rated DC Voltage	Capacitance Value	DF (%)	Cap Shift	IR
X7R	>25	All	3.0	± 20%	10% of Initial Limit
	16/25		5.0		
	<16		7.5		

Insulation Resistance Limit Table (X7R Dielectric)

EIA Case Size	1,000 Megohm **Microfarads or 100GΩ**	100 Megohm **Microfarads or 10GΩ**
0805	< .0039µF	≥ .0039µF
1206	< 0.012µF	≥ 0.012µF
1210	< 0.033µF	≥ 0.033µF
1808	< 0.018µF	≥ 0.018µF
1812	< 0.027µF	≥ 0.027µF

Table 1A – Capacitance Range/Selection Waterfall (0805–1812 Case Sizes)

Cap	Cap Code	Series			C0805			C1206					C1210					C1808							C1812						
		Voltage Code			C	B	D	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Voltage DC			500	630	1000	500	630	1000	1500	2000	500	630	1000	1500	2000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Cap Tolerance			**Product Availability and Chip Thickness Codes - See Table 2 for Chip Thickness Dimensions**																										
10 pF	100	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
11 pF	110	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
12 pF	120	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
13 pF	130	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
15 pF	150	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
16 pF	160	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
18 pF	180	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
20 pF	200	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
22 pF	220	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
24 pF	240	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
27 pF	270	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
30 pF	300	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
33 pF	330	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
36 pF	360	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
39 pF	390	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
43 pF	430	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
47 pF	470	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
51 pF	510	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
56 pF	560	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
62 pF	620	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
68 pF	680	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
75 pF	750	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
82 pF	820	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
91 pF	910	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
100 pF	101	J	K	M	DG	DG	DG	EG	EG	EG	EG	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
110 pF	111	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FM	FM	FM	FM	FM	LB	LB	LB	LB	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
120 pF	121	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FM	FM	FM	FM	FM	LA	LA	LA	LA	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
130 pF	131	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
150 pF	151	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FM	LA	LA	LA	LA	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
180 pF	181	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LB	LB	GK	GK	GK	GK	GK	GK	GK
220 pF	221	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FM	LA	LA	LA	LA	LC	LB	LB	GK	GK	GK	GK	GK	GK	GK
270 pF	271	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LB	LC	GK	GK	GK	GK	GK	GK	GK
330 pF	331	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LB	LC	GK	GK	GK	GK	GK	GK	GK
390 pF	391	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LB	LC	GK	GK	GK	GK	GK	GK	GK
470 pF	471	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LB	LC	GH	GH	GH	GH	GH	GK	GK
560 pF	561	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LB	LC	GH	GH	GH	GH	GH	GK	GK
680 pF	681	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LC	LC	GH	GH	GH	GH	GH	GK	GK
820 pF	821	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LC	LC	GH	GH	GH	GH	GH	GK	GK
1,000 pF	102	J	K	M	DG	DG	DG	EF	EF	EF	EF	EG	FL	FL	FL	FL	FL	LA	LA	LA	LA	LB	LC	LC	GH	GH	GH	GH	GH	GK	GK
1,200 pF	122	J	K	M	DG	DG	DG	EF	EF	EF	EG	EG	FL	FL	FL	FL	FM	LB	LB	LB	LB	LC			GH	GH	GH	GH	GH	GK	GK
1,500 pF	152	J	K	M	DG	DG	DG	EF	EF	EF	EG	EG	FL	FL	FL	FL	FM	LA	LA	LA	LB	LC			GH	GH	GH	GH	GH		
1,800 pF	182	J	K	M	DG	DG	DG	EF	EF	EF	EG	EG	FL	FL	FL	FL	FM	LA	LA	LA	LB	LC			GH	GH	GH	GH	GH		
2,000 pF	202	J	K	M	DG	DG	DG	EF	EF	EF	EG	EG	FL	FL	FL	FL	FM	LA	LA	LA	LB	LC			GH	GH	GH	GH	GH		
2,200 pF	222	J	K	M	DG	DG	DG	EF	EF	EF	EG	EG	FL	FL	FL	FL	FM	LA	LA	LA	LB	LC			GH	GH	GH	GH	GH		
2,700 pF	272	J	K	M	DG	DG	DG	EF	EF	EF	EG		FL	FL	FL	FL	FM	LA	LA	LA	LB	LC			GH	GH	GH	GH	GK		
3,300 pF	332	J	K	M	DG	DG	DG	EF	EF	EF	EG		FL	FL	FL	FL	FM	LA	LA	LA	LB				GH	GH	GH	GH	GK		
3,900 pF	392	J	K	M	DG	DG	DG	EF	EF	EF	EG		FL	FL	FL	FL	FK	LA	LA	LA	LB				GH	GH	GH	GH	GK		
4,700 pF	472	J	K	M	DG	DG	DG	EF	EF	EF	EG		FL	FL	FL	FL	FK	LA	LA	LA	LB				GH	GH	GH	GH			
5,600 pF	562	J	K	M	DG	DG		EF	EF	EF			FL	FL	FL	FM		LA	LB	LB	LC				GH	GH	GH	GK			
6,800 pF	682	J	K	M	DG	DG		EG	EG	EG			FL	FL	FL	FM		LA	LB	LB	LC				GH	GH	GH	GK			
8,200 pF	822	J	K	M	DG	DG		EG	EG	EG			FL	FL	FL	FK		LA	LB	LB	LC				GH	GH	GH	GK			
10,000 pF	103	J	K	M	DG			EG	EG	EG			FL	FL	FL	FK		LA	LB	LB	LC				GH	GH	GH	GK			
12,000 pF	123	J	K	M	DG			EG	EE	EE			FL	FL	FL	FK		LA	LC	LC					GH	GK	GK	GK			
Cap	**Cap Code**	Voltage DC			500	630	1000	500	630	1000	1500	2000	500	630	1000	1500	2000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Voltage Code			C	B	D	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Series			**C0805**			**C1206**					**C1210**					**C1808**							**C1812**						

KEMET reserves the right to substitute product with an improved temperature characteristic, tighter capacitance tolerance and/or higher voltage capability within the same form factor (configuration and dimensions).

Table 1A – Capacitance Range/Selection Waterfall (0805–1812 Case Sizes) cont'd

Cap	Cap Code	Series	C0805			C1206					C1210					C1808							C1812						
		Voltage Code	C	B	D	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Voltage DC	500	630	1000	500	630	1000	1500	2000	500	630	1000	1500	2000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Cap Tolerance	J K M			Product Availability and Chip Thickness Codes - See Table 2 for Chip Thickness Dimensions																							
15,000 pF	153	J K M				EG	EF	EF			FL	FL	FL			LA	LC	LC					GH	GK	GK				
18,000 pF	183	J K M				EJ	EJ	EJ			FL	FL	FL			LA	LE	LE					GH	GK	GK				
22,000 pF	223	J K M				EJ	EJ	EJ			FL	FM	FM			LA	LE	LE					GH	GK	GK				
27,000 pF	273	J K M				EJ	EJ				FM	FK	FK			LA	LE	LE					GH	GB	GB				
33,000 pF	333	J K M				EJ	EJ				FM	FG	FH			LC	LA	LA					GH	GB	GB				
39,000 pF	393	J K M				EJ					FK	FG	FH			LC	LA	LA					GH	GB	GB				
47,000 pF	473	J K M				EJ					FK	FH	FK			LC	LA	LB					GH	GB	GC				
56,000 pF	563	J K M				EJ					FG	FH	FK			LC	LA	LB					GH	GB	GE				
62,000 pF	623	J K M				EJ					FG	FM	*UD*			LA	LA	LC					GK	GB	GE				
68,000 pF	683	J K M				EJ					FG	FM	*UD*			LA	LA	LC					GB	GB	GE				
82,000 pF	823	J K M									FH	FK				LA	LC						GB	GE	GK				
0.10 uF	104	J K M									FM	*UD*				LA	LC						GB	GE	GJ				
0.12 uF	124	J K M									FK					LA							GE	GH					
0.15 uF	154	J K M									FK					LB							GE	GJ					
0.18 uF	184	J K M																					GF						
0.22 uF	224	J K M																					GJ						
0.27 uF	274	J K M																					GL						
0.33 uF	334	J K M																					GS						
Cap	Cap Code	Voltage DC	500	630	1000	500	630	1000	1500	2000	500	630	1000	1500	2000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Voltage Code	C	B	D	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Series	C0805			C1206					C1210					C1808							C1812						

Table 1B – Capacitance Range/Selection Waterfall (1825–2225 Case Sizes)

Cap	Cap Code	Series	C1825							C2220							C2225						
		Voltage Code	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Voltage DC	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Cap Tolerance	J K M	Product Availability and Chip Thickness Codes - See Table 2 for Chip Thickness Dimensions																			
100 pF	101	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
110 pF	111	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
120 pF	121	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
130 pF	131	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
150 pF	151	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
180 pF	181	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
220 pF	221	J K M	HE	HE	HE	HE	HE	HE	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
270 pF	271	J K M	HE	HE	HE	HE	HE	HE	HG	JP	JP	JP	JP	JP	JP	JP	KE	KE	KE	KE	KE	KE	KF
330 pF	331	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KE	KE	KE	KE	KE	KE	KF
390 pF	391	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KE	KE	KE	KE	KE	KE	KF
470 pF	471	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
560 pF	561	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
680 pF	681	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
820 pF	821	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
1,000 pF	102	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
1,200 pF	122	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
1,500 pF	152	J K M	HG	HG	HG	HG	HG	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
1,800 pF	182	J K M	HE	HE	HE	HE	HE	HG	HG	JP	JP	JP	JP	JP	JP	JP	KF	KF	KF	KF	KF	KF	KF
2,000 pF	202	J K M	HE	HE	HE	HE	HE	HG	HG	JE	JE	JE	JE	JE	JP	JP	KF	KF	KF	KF	KF	KF	KF
2,200 pF	222	J K M	HE	HE	HE	HE	HE	HG	HG	JE	JE	JE	JE	JE	JP	JP	KF	KF	KF	KF	KF	KF	KF
Cap	Cap Code	Voltage DC	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Voltage Code	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Series	C1825							C2220							C2225						

UD = Under development

KEMET reserves the right to substitute product with an improved temperature characteristic, tighter capacitance tolerance and/or higher voltage capability within the same form factor (configuration and dimensions).

Table 1B – Capacitance Range/Selection Waterfall (1825–2225 Case Sizes) cont'd

Cap	Cap Code	Series			C1825							C2220							C2225						
		Voltage Code			C	B	D	F	G	Z	H	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Voltage DC			500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Cap Tolerance			**Product Availability and Chip Thickness Codes - See Table 2 for Chip Thickness Dimensions**																				
2,700 pF	272	J	K	M	HE	HE	HE	HE	HE	HG	HG	JE	JE	JE	JE	JE	JP	JP	KE	KE	KE	KE	KE	KF	KF
3,300 pF	332	J	K	M	HE	HE	HE	HE	HE	HG	HG	JE	JE	JE	JE	JE	JP	JP	KE	KE	KE	KE	KE	KF	KF
3,900 pF	392	J	K	M	HE	HE	HE	HE	HE			JE	JE	JE	JE	JE	JP	JP	KE	KE	KE	KE	KE	KF	KF
4,700 pF	472	J	K	M	HE	HE	HE	HE	HE			JE	JE	JE	JE	JP			KE	KE	KE	KE	KE	KF	KF
5,600 pF	562	J	K	M	HE	HE	HE	HE	HE			JE	JE	JE	JE	JP			KE	KE	KE	KE	KE	KF	KF
6,800 pF	682	J	K	M	HE	HE	HE	HE	HE			JE	JE	JE	JE	JP			KE	KE	KE	KE	KF		
8,200 pF	822	J	K	M	HE	HE	HE	HE	HE			JE	JE	JE	JE	JP			KE	KE	KE	KE	KF		
10,000 pF	103	J	K	M	HE	HE	HE	HE				JE	JE	JE	JE				KE	KE	KE	KE	KF		
12,000 pF	123	J	K	M	HE	HE	HE	HG				JE	JP	JP	JP				KE	KE	KE	KE	KF		
15,000 pF	153	J	K	M	HE	HE	HE	HG				JE	JP	JP	JP				KE	KE	KE	KE			
18,000 pF	183	J	K	M	HE	HE	HE	HG				JE	JP	JP	JP				KE	KE	KE	KE			
22,000 pF	223	J	K	M	HE	HG	HG	HG				JE	JP	JP	JP				KE	KF	KF	KF			
27,000 pF	273	J	K	M	HE	HG	HG	HG				JE	JP	JP	JP				KE	KF	KF	KF			
33,000 pF	333	J	K	M	HE	HG	HG					JE	JP	JP	JP				KE	KF	KF	KF			
39,000 pF	393	J	K	M	HE	HG	HG					JE	JP	JP					KE	KF	KF	KF			
47,000 pF	473	J	K	M	HE	HG	HG					JE	JP	JP					KE	KF	KF	KF			
56,000 pF	563	J	K	M	HE							JE							KE	KF	KF				
62,000 pF	623	J	K	M	HG							JE							KE	KF	KF				
68,000 pF	683	J	K	M	HG							JE							KE	KF	KF				
82,000 pF	823	J	K	M	HG							JE							KE	KF	KF				
0.10 µF	104	J	K	M	HG							JE							KE						
0.12 µF	124	J	K	M	HG							JE							KE						
0.15 µF	154	J	K	M	HG							JP							KF						
0.18 µF	184	J	K	M	HG							JP							KF						
0.22 µF	224	J	K	M	HG							JP							KF						
0.27 µF	274	J	K	M															KF						
0.33 µF	334	J	K	M																					
0.39 µF	394	J	K	M																					
0.47 µF	474	J	K	M																					
0.56 µF	564	J	K	M																					
0.68 µF	684	J	K	M																					
0.82 µF	824	J	K	M																					
1.0 µF	105	J	K	M																					
1.2 µF	125	J	K	M																					
Cap	**Cap Code**	Voltage DC			500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000	500	630	1000	1500	2000	2500	3000
		Voltage Code			C	B	D	F	G	Z	H	C	B	D	F	G	Z	H	C	B	D	F	G	Z	H
		Series			**C1825**							**C2220**							**C2225**						

KEMET reserves the right to substitute product with an improved temperature characteristic, tighter capacitance tolerance and/or higher voltage capability within the same form factor (configuration and dimensions).

Table 2 – Chip Thickness/Packaging Quantities

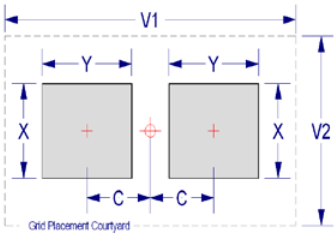
Thickness Code	Case Size	Thickness ± Range (mm)	Paper Quantity		Plastic Quantity	
			7" Reel	13" Reel	7" Reel	13" Reel
DG	0805	1.25 ± 0.15	0	0	2,500	10,000
EE	1206	1.10 ± 0.10	0	0	2,500	10,000
EF	1206	1.20 ± 0.15	0	0	2,500	10,000
EG	1206	1.60 ± 0.15	0	0	2,000	8,000
EJ	1206	1.70 ± 0.20	0	0	2,000	8,000
FG	1210	1.25 ± 0.15	0	0	2,500	10,000
FL	1210	1.40 ± 0.15	0	0	2,000	8,000
FH	1210	1.55 ± 0.15	0	0	2,000	8,000
FM	1210	1.70 ± 0.20	0	0	2,000	8,000
FK	1210	2.10 ± 0.20	0	0	2,000	8,000
LE	1808	1.00 ± 0.10	0	0	2,500	10,000
LA	1808	1.40 ± 0.15	0	0	1,000	4,000
LB	1808	1.60 ± 0.15	0	0	1,000	4,000
LC	1808	2.00 ± 0.15	0	0	1,000	4,000
GB	1812	1.00 ± 0.10	0	0	1,000	4,000
GC	1812	1.10 ± 0.10	0	0	1,000	4,000
GE	1812	1.30 ± 0.10	0	0	1,000	4,000
GH	1812	1.40 ± 0.15	0	0	1,000	4,000
GF	1812	1.50 ± 0.10	0	0	1,000	4,000
GK	1812	1.60 ± 0.20	0	0	1,000	4,000
GJ	1812	1.70 ± 0.15	0	0	1,000	4,000
GL	1812	1.90 ± 0.20	0	0	1,000	4,000
GS	1812	2.10 ± 0.20	0	0	1,000	4,000
HE	1825	1.40 ± 0.15	0	0	1,000	4,000
HG	1825	1.60 ± 0.20	0	0	1,000	4,000
JE	2220	1.40 ± 0.15	0	0	1,000	4,000
JP	2220	1.60 ± 0.20	0	0	1,000	4,000
KE	2225	1.40 ± 0.15	0	0	1,000	4,000
KF	2225	1.60 ± 0.20	0	0	1,000	4,000
Thickness Code	**Case Size**	**Thickness ± Range (mm)**	**7" Reel**	**13" Reel**	**7" Reel**	**13" Reel**
			Paper Quantity		**Plastic Quantity**	

Package quantity based on finished chip thickness specifications

Table 3 – Chip Capacitor Land Pattern Design Recommendations per IPC–7351

EIA Size Code	Metric Size Code	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
		C	Y	X	V1	V2	C	Y	X	V1	V2	C	Y	X	V1	V2
01005	0402	0.33	0.46	0.43	1.60	0.90	0.28	0.36	0.33	1.30	0.70	0.23	0.26	0.23	1.00	0.50
0201	0603	0.38	0.56	0.52	1.80	1.00	0.33	0.46	0.42	1.50	0.80	0.28	0.36	0.32	1.20	0.60
0402	1005	0.50	0.72	0.72	2.20	1.20	0.45	0.62	0.62	1.90	1.00	0.40	0.52	0.52	1.60	0.80
0603	1608	0.90	1.15	1.10	4.00	2.10	0.80	0.95	1.00	3.10	1.50	0.60	0.75	0.90	2.40	1.20
0805	2012	1.00	1.35	1.55	4.40	2.60	0.90	1.15	1.45	3.50	2.00	0.75	0.95	1.35	2.80	1.70
1206	3216	1.60	1.35	1.90	5.60	2.90	1.50	1.15	1.80	4.70	2.30	1.40	0.95	1.70	4.00	2.00
1210	3225	1.60	1.35	2.80	5.65	3.80	1.50	1.15	2.70	4.70	3.20	1.40	0.95	2.60	4.00	2.90
1808	4520	2.30	1.75	2.30	7.40	3.30	2.20	1.55	2.20	6.50	2.70	2.10	1.35	2.10	5.80	2.40
1812	4532	2.15	1.60	3.60	6.90	4.60	2.05	1.40	3.50	6.00	4.00	1.95	1.20	3.40	5.30	3.70
1825	4564	2.15	1.60	6.90	6.90	7.90	2.05	1.40	6.80	6.00	7.30	1.95	1.20	6.70	5.30	7.00
2220	5650	2.75	1.70	5.50	8.20	6.50	2.65	1.50	5.40	7.30	5.90	2.55	1.30	5.30	6.60	5.60
2225	5664	2.70	1.70	6.90	8.10	7.90	2.60	1.50	6.80	7.20	7.30	2.50	1.30	6.70	6.50	7.00

Density Level A: For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes. KEMET only recommends wave soldering of EIA 0603, 0805 and 1206 case sizes.
Density Level B: For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.
Density Level C: For high component density product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC Standard 7351 (IPC–7351).



Soldering Process

Recommended Soldering Technique:
- Solder wave or solder reflow for EIA case sizes 0603, 0805 and 1206
- All other EIA case sizes are limited to solder reflow only

Recommended Soldering Profile:
- KEMET recommends following the guidelines outlined in IPC/JEDEC J-STD-020

Table 4 – Performance & Reliability: Test Methods and Conditions

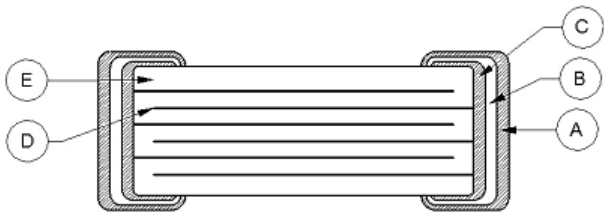
Stress	Reference	Test or Inspection Method
Terminal Strength	JIS-C-6429	Appendix 1, Note: Force of 1.8kg for 60 seconds.
Board Flex	JIS-C-6429	Appendix 2, Note: 2 mm (min) for all except 3 mm for C0G.
Solderability	J-STD-002	Magnification 50 X. Conditions:
		a) Method B, 4 hours @ 155°C, dry heat @ 235°C
		b) Method B @ 215°C category 3
		c) Method D, category 3 @ 260°C
Temperature Cycling	JESD22 Method JA-104	1,000 cycles (-55°C to +125°C), measurement at 24 hours. +/- 2 hours after test conclusion.
Biased Humidity	MIL-STD-202 Method 103	Load Humidity: 1,000 hours 85°C/85%RH and 300VDC Maximum Add 100K ohm resistor. Measurement at 24 hours. +/- 2 hours after test conclusion.
		Low Volt Humidity: 1,000 hours 85°C/85%RH and 1.5V. Add 100K ohm resistor. Measurement at 24 hours. +/- 2 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. +/- 2 hours after test conclusion.
Thermal Shock	MIL-STD-202 Method 107	-55°C/+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	1,000 hours at 125°C (85°C for X5R, Z5U and Y5V) with rated voltage applied.
Storage Life	MIL-STD-202 Method 108	150°C, 0VDC, for 1000 hours.
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213, Condition F.
Resistance to Solvents	MIL-STD-202 Method 215	Add aqueous wash chemical, OKEM Clean or equivalent.

Storage and Handling

Ceramic chip capacitors should be stored in normal working environments. While the chips themselves are quite robust in other environments, solderability 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 – reels may soften or warp, and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40ºC, and maximum storage humidity not exceed 70% relative humidity. Temperature fluctuations should be minimized to avoid condensation on the parts, and atmospheres should be free of chlorine and sulfur bearing compounds. For optimized solderability, chip stock should be used promptly, preferably within 1.5 years of receipt.

Construction

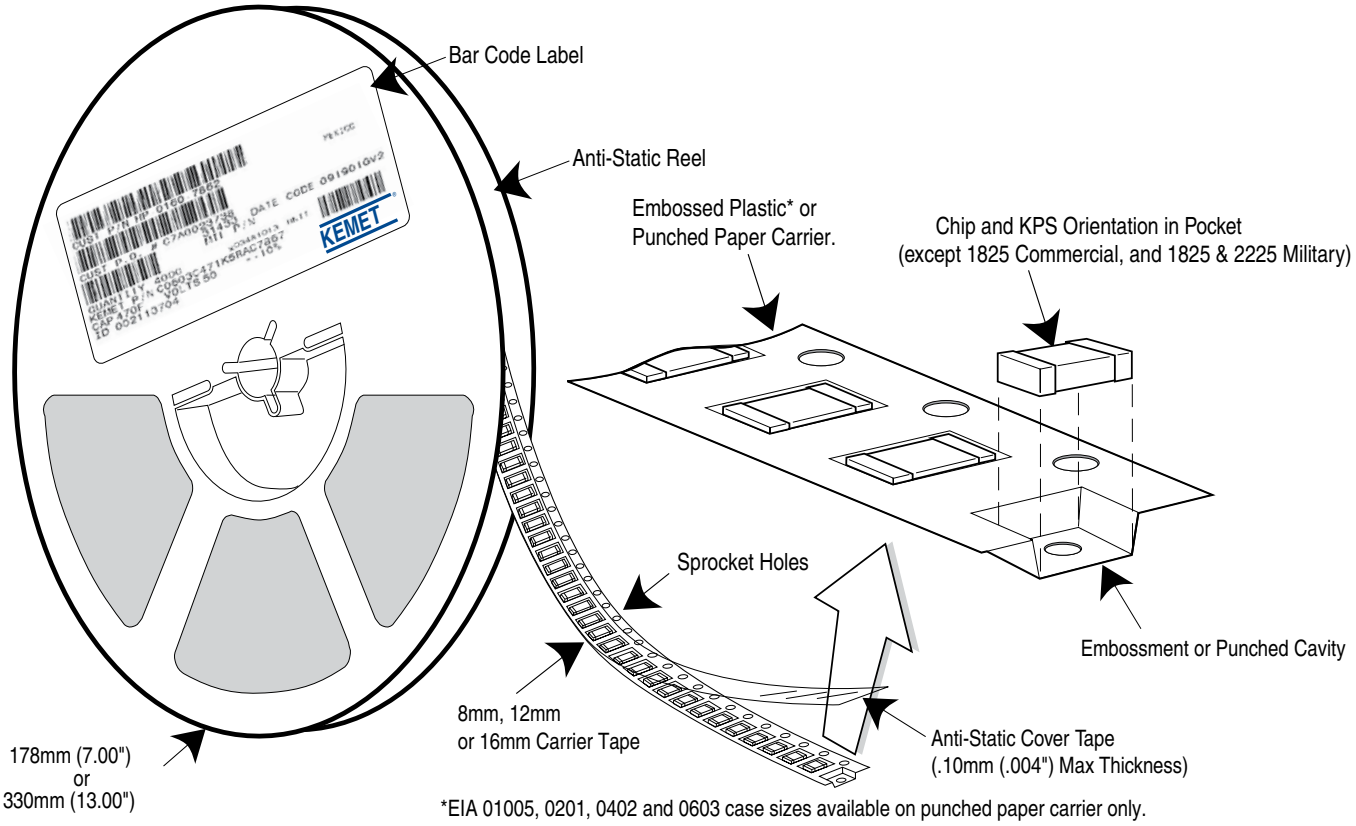
Reference	Item		Material	
A	Termination System	Finish	100% Matte Sn	SnPb (5% min)
B		Barrier Layer	Ni	
D		Base metal	Cu	
E	Inner Electrode		Ni	
F	Dielectric Material		$BaTiO_3$	



Note: Image is exaggerated in order to clearly identify all components of construction.

Tape & Reel Packaging Information

KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8 mm, 12 mm and 16 mm tape on 7" and 13" reels in accordance with EIA Standard 481. This packaging system is compatible with all tape fed automatic pick and place systems. See Table 2 for details on reeling quantities for commercial chips.



*EIA 01005, 0201, 0402 and 0603 case sizes available on punched paper carrier only.

Table 5 – Carrier Tape Configuration (mm)

EIA Case Size	Tape Size (W)*	Lead Space (P_1)*
01005 - 0402	8	2
0603 - 1210	8	4
1805 - 1808	12	4
≥ 1812	12	8
KPS 1210	12	8
KPS 1812 & 2220	16	12
Array 0508 & 0612	8	4

**Refer to Figure 1 for W and P_1 carrier tape reference locations.*
**Refer to Table 6 for tolerance specifications.*

Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

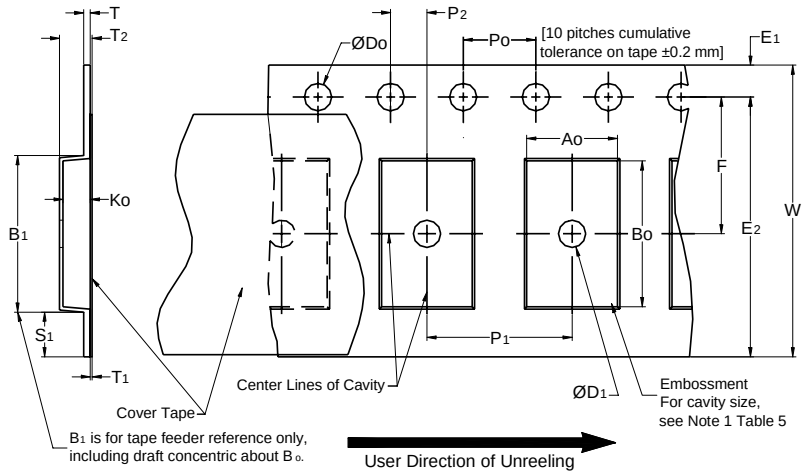


Table 6 – Embossed (Plastic) Carrier Tape Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)									
Tape Size	D_0	D_1 Min. Note 1	E_1	P_0	P_2	R Ref. Note 2	S_1 Min. Note 3	T Max.	T_1 Max.
8 mm	1.5 +0.10/-0.0 (0.059 +0.004/-0.0)	1.0 (0.039)	1.75 ± 0.10 (0.069 ± 0.004)	4.0 ± 0.10 (0.157 ± 0.004)	2.0 ± 0.05 (0.079 ± 0.002)	25.0 (0.984)	0.600 (0.024)	0.600 (0.024)	0.100 (0.004)
12 mm		1.5 (0.059)				30 (1.181)			
16 mm									

Variable Dimensions — Millimeters (Inches)								
Tape Size	Pitch	B_1 Max. Note 4	E_2 Min.	F	P_1	T_2 Max	W Max	A_0,B_0 & K_0
8 mm	Single (4 mm)	4.35 (0.171)	6.25 (0.246)	3.5 ± 0.05 (0.138 ± 0.002)	4.0 ± 0.10 (0.157 ± 0.004)	2.5 (0.098)	8.3 (0.327)	Note 5
12 mm	Single (4 mm) & Double (8 mm)	8.2 (0.323)	10.25 (0.404)	5.5 ± 0.05 (0.217 ± 0.002)	8.0 ± 0.10 (0.315 ± 0.004)	4.6 (0.181)	12.3 (0.484)	
16 mm	Triple (12 mm)	12.1 (0.476)	14.25 (0.561)	5.5 ± 0.05 (0.217 ± 0.002)	8.0 ± 0.10 (0.315 ± 0.004)	4.6 (0.181)	16.3 (0.642)	

1. 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.

2. The tape with or without components shall pass around R without damage (see Figure 5).

3. If S_1<1.0 mm, there may not be enough area for cover tape to be properly applied (see EIA Standard 481 paragraph 4.3 section b).

4. B1 dimension is a reference dimension for tape feeder clearance only.

5. The cavity defined by A_0, B_0 and K_0 shall surround the component with sufficient clearance that:

(a) the component does not protrude above the top surface of the carrier tape.

(b) the component can be removed from the cavity in a vertical direction without mechanical restriction, after the top cover tape has been removed.

(c) rotation of the component is limited to 20° maximum for 8 and 12 mm tapes and 10° maximum for 16 mm tapes (see Figure 3).

(d) lateral movement of the component is restricted to 0.5 mm maximum for 8 mm and 12 mm wide tape and to 1.0 mm maximum for 16 mm tape (see Figure 4).

(e) for KPS Series product, A_0 and B_0 are measured on a plane 0.3 mm above the bottom of the pocket.

(f) see Addendum in EIA Standard 481 for standards relating to more precise taping requirements.

Figure 2 – Punched (Paper) Carrier Tape Dimensions

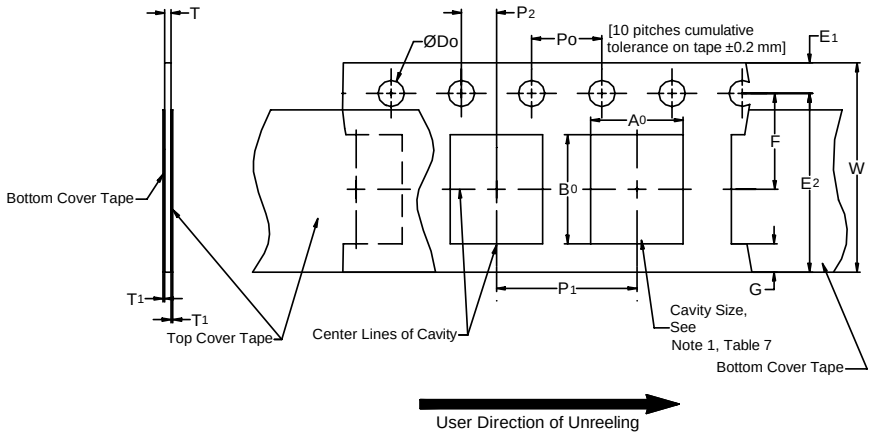


Table 7 – Punched (Paper) Carrier Tape Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)							
Tape Size	D_0	E_1	P_0	P_2	T_1 Max	G Min	R Ref. Note 2
8 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)	0.10 (.004) Max.	0.75 (.030)	25 (.984)

Variable Dimensions — Millimeters (Inches)							
Tape Size	Pitch	E2 Min	F	P_1	T Max	W Max	A_0 B_0
8 mm	Half (2 mm)	6.25 (0.246)	3.5 ± 0.05 (0.138 ± 0.002)	2.0 ± 0.05 (0.079 ± 0.002)	1.1 (0.098)	8.3 (0.327)	Note 1
8 mm	Single (4 mm)			4.0 ± 0.10 (0.157 ± 0.004)		8.3 (0.327)	

1. The cavity defined by A_0, B_0 and T shall surround the component with sufficient clearance that:
a) the component does not protrude beyond either surface of the carrier tape.
b) the component can be removed from the cavity in a vertical direction without mechanical restriction, after the top cover tape has been removed.
d) lateral movement of the component is restricted to 0.5 mm maximum (see Figure 4).
e) see Addendum in EIA Standard 481 for standards relating to more precise taping requirements.
2. The tape with or without components shall pass around R without damage (see Figure 5).

Packaging Information Performance Notes

1. Cover Tape Break Force: 1.0 Kg minimum.
2. 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 (10gf to 100gf)
12 mm & 16 mm	0.1 Newton to 1.3 Newton (10gf to 130gf)

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.
3. Labeling: Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. Refer to EIA Standards 556 and 624.

Figure 3 – Maximum Component Rotation

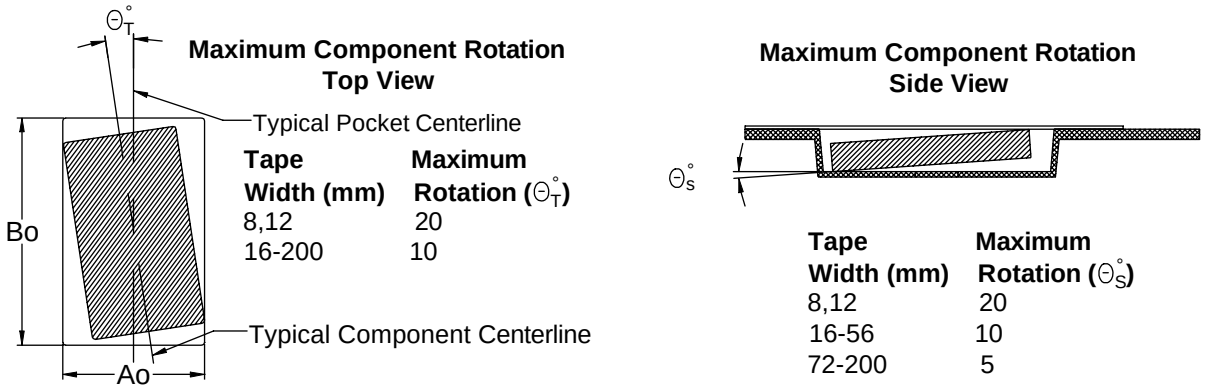


Figure 4 – Maximum Lateral Movement

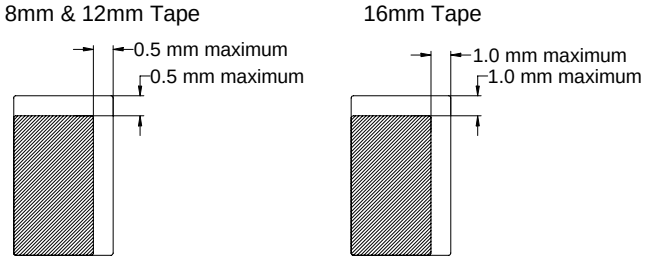


Figure 5 – Bending Radius

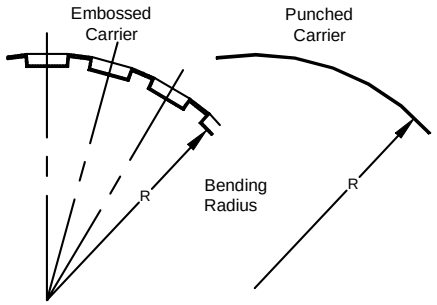
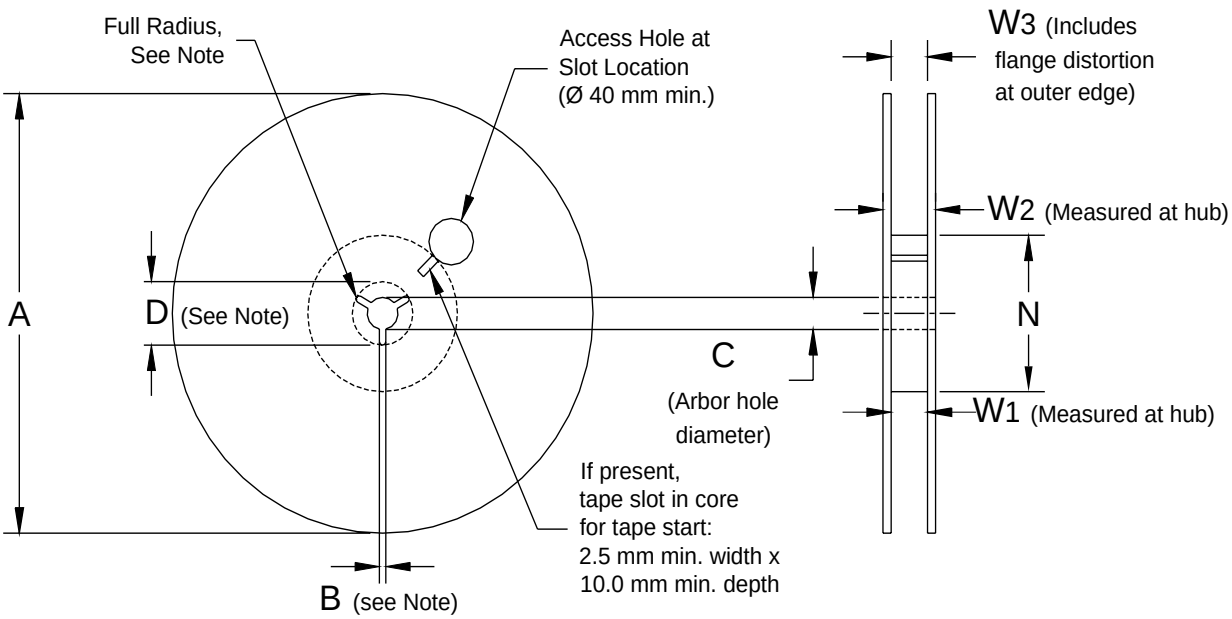


Figure 6 – Reel Dimensions



Note: Drive spokes optional; if used, dimensions B and D shall apply.

Table 8 – Reel Dimensions

Metric will govern

Constant Dimensions — Millimeters (Inches)				
Tape Size	A	B Min	C	D Min
8 mm	178 ± 0.20 (7.008 ± 0.008) or 330 ± 0.20 (13.000 ± 0.008)	1.5 (0.059)	13.0 +0.5/-0.2 (0.521 +0.02/-0.008)	20.2 (0.795)
12 mm				
16 mm				

Variable Dimensions — Millimeters (Inches)				
Tape Size	N Min	W_1	W_2 Max	W_3
8 mm	50 (1.969)	8.4 +1.5/-0.0 (0.331 +0.059/-0.0)	14.4 (0.567)	Shall accommodate tape width without interference
12 mm		12.4 +2.0/-0.0 (0.488 +0.078/-0.0)	18.4 (0.724)	
16 mm		16.4 +2.0/-0.0 (0.646 +0.078/-0.0)	22.4 (0.882)	

Figure 7 – Tape Leader & Trailer Dimensions

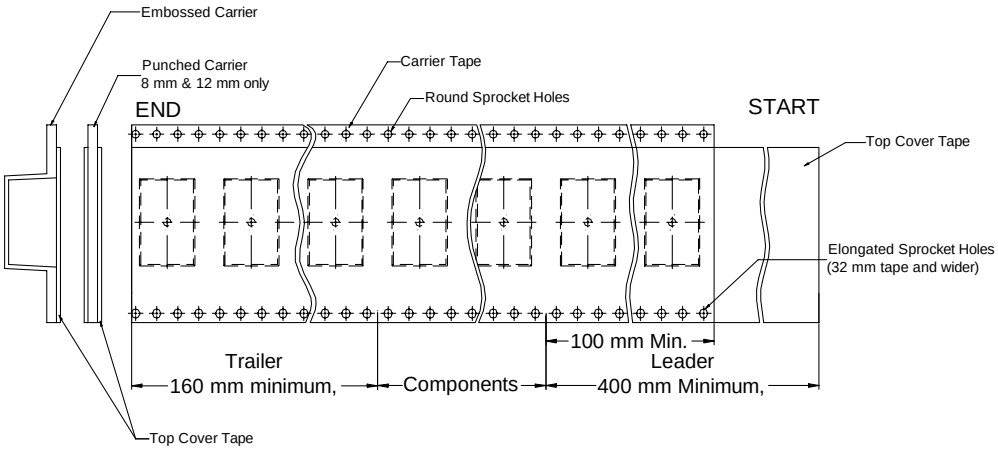


Figure 8 – Maximum Camber

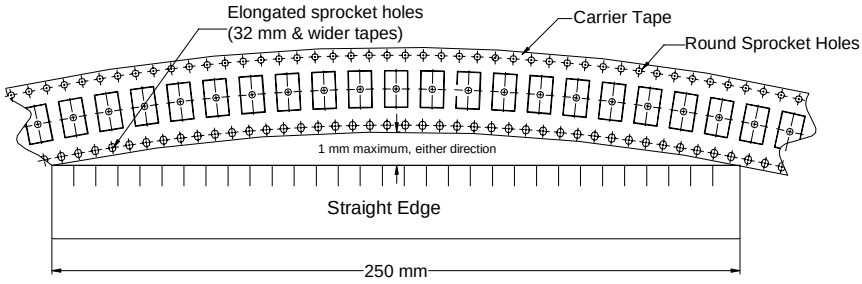


Figure 9 – Bulk Cassette Packaging (Ceramic Chips Only)

Meets Dimensional Requirements IEC Standard 286 and EIAJ Standard 7201

*Unit mm *Reference*

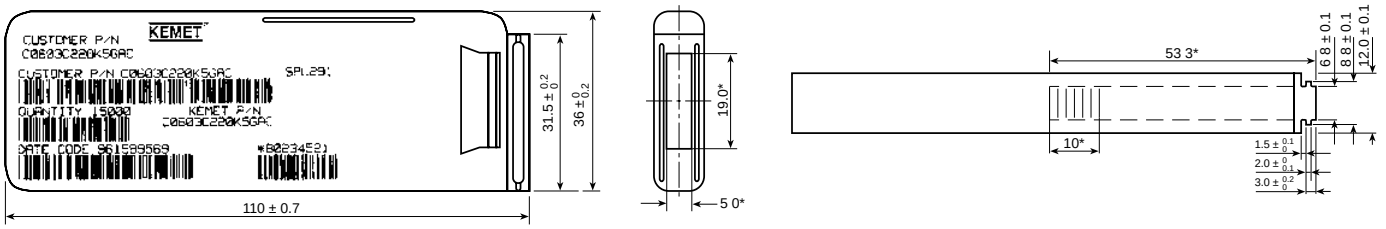


Table 9 – Capacitor Dimensions for Bulk Cassette

Cassette Packaging – Millimeters

EIA Size Code	Metric Size Code	L Length	W Width	B Bandwidth	S Separation minimum	T Thickness	Number of **Pcs/Cassette**
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.2 to 0.4	0.3	0.5 ± .05	50,000
0603	1608	1.6 ± 0.07	0.8 ± 0.07	0.2 to 0.5	0.7	0.8 ± .07	15,000

Table 10 – Capacitor Marking

Laser marking is available as an extra-cost option for most KEMET ceramic chips. Such marking is two sided, and includes a K to identify KEMET, followed by two characters (per EIA Standard 198) to identify the capacitance value. Note that marking is not available for any Y5V chip. In addition, the 0603 marking option is limited to the K only. (Marking optional. Not available for 0402 size.)

Numeral / Alpha Character	Capacitance (pF) For Various Numeral Identifiers								
	9	0	1	2	3	4	5	6	7
A	0.1	1	10	100	1000	10000	100000	1000000	10000000
B	0.11	1.1	11	110	1100	11000	110000	1100000	11000000
C	0.12	1.2	12	120	1200	12000	120000	1200000	12000000
D	0.13	1.3	13	130	1300	13000	130000	1300000	13000000
E	0.15	1.5	15	150	1500	15000	150000	1500000	15000000
F	0.16	1.6	16	160	1600	16000	160000	1600000	16000000
G	0.18	1.8	18	180	1800	18000	180000	1800000	18000000
H	0.2	2	20	200	2000	20000	200000	2000000	20000000
J	0.22	2.2	22	220	2200	22000	220000	2200000	22000000
K	0.24	2.4	24	240	2400	24000	240000	2400000	24000000
L	0.27	2.7	27	270	2700	27000	270000	2700000	27000000
M	0.3	3	30	300	3000	30000	300000	3000000	30000000
N	0.33	3.3	33	330	3300	33000	330000	3300000	33000000
P	0.36	3.6	36	360	3600	36000	360000	3600000	36000000
Q	0.39	3.9	39	390	3900	39000	390000	3900000	39000000
R	0.43	4.3	43	430	4300	43000	430000	4300000	43000000
S	0.47	4.7	47	470	4700	47000	470000	4700000	47000000
T	0.51	5.1	51	510	5100	51000	510000	5100000	51000000
U	0.56	5.6	56	560	5600	56000	560000	5600000	56000000
V	0.62	6.2	62	620	6200	62000	620000	6200000	62000000
W	0.68	6.8	68	680	6800	68000	680000	6800000	68000000
X	0.75	7.5	75	750	7500	75000	750000	7500000	75000000
Y	0.82	8.2	82	820	8200	82000	820000	8200000	82000000
Z	0.91	9.1	91	910	9100	91000	910000	9100000	91000000
a	0.25	2.5	25	250	2500	25000	250000	2500000	25000000
b	0.35	3.5	35	350	3500	35000	350000	3500000	35000000
d	0.4	4	40	400	4000	40000	400000	4000000	40000000
e	0.45	4.5	45	450	4500	45000	450000	4500000	45000000
f	0.5	5	50	500	5000	50000	500000	5000000	50000000
m	0.6	6	60	600	6000	60000	600000	6000000	60000000
n	0.7	7	70	700	7000	70000	700000	7000000	70000000
t	0.8	8	80	800	8000	80000	800000	8000000	80000000
y	0.9	9	90	900	9000	90000	900000	9000000	90000000



Example shown is 1,000 pF capacitor

KEMET Corporation World Headquarters

2835 KEMET Way
Simpsonville, SC 29681

Mailing Address:
P.O. Box 5928
Greenville, SC 29606

www.kemet.com
Tel: 864-963-6300
Fax: 864-963-6521

Corporate Offices
Fort Lauderdale, FL
Tel: 954-766-2800

North America

Southeast
Lake Mary, FL
Tel: 407-855-8886

Northeast
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Northern Europe
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Asia

Northeast Asia
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Tel: 86-755-2518-1306

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Tel: 886-2-27528585

Southeast Asia
Singapore
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