

Overview

KEMET's X7R dielectric features a 125°C maximum operating temperature and is considered "temperature stable." The Electronics Components, Assemblies & Materials Association (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 $\pm 15\%$ from -55°C to +125°C.

Benefits

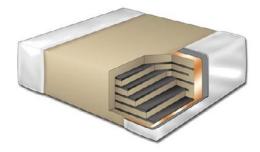
- -55°C to +125°C operating temperature range
- · Lead (Pb)-Free, RoHS, and REACH Compliant
- Temperature stable dielectric

Ordering Information

- EIA 0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, and 2225 case sizes
- DC voltage ratings of 6.3 V, 10 V, 16 V, 25 V, 50 V, 100 V, 200 V, and 250 V
- Capacitance offerings ranging from 10 pF to 47 μF
- Available capacitance tolerances of $\pm 5\%$, $\pm 10\%$, and $\pm 20\%$
- Non-polar device, minimizing installation concerns
- 100% pure matte tin-plated termination finish allowing for excellent solderability
- SnPb termination finish option available upon request (5% minimum)

Applications

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



С	1206	С	106	М	4	R	Α	С	TU
Ceramic	Case Size (L" x W")	Specification/ Series ¹	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Dielectric	Failure Rate/ Design	Termination Finish ²	Packaging/Grade (C-Spec) ³
	0402 0603 0805 1206 1210 1808 1812 1825 2220 2225	C = Standard	2 Significant Digits + Number of Zeros	J = ±5% K = ±10% M = ±20%	9 = 6.3 V 8 = 10 V 4 = 16 V 3 = 25 V 6 = 35 V 5 = 50 V 1 = 100 V 2 = 200 V A = 250 V	R = X7R	A = N/A	C = 100% Matte Sn	Blank = Bulk TU = 7" Reel Unmarked TM = 7" Reel Marked

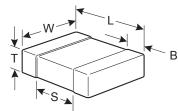
¹ Flexible termination option is available. Please see FT-CAP product bulletin C1013_X7R_FT-CAP_SMD.

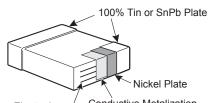
² Additional termination finish options may be available. Contact KEMET for details.

³ Additional reeling or packaging options may be available. Contact KEMET for details.



Dimensions – Millimeters (Inches)





Electrodes / Conductive Metalization

EIA Size Code	Metric Size Code	L Length	W Width	T Thickness	B Bandwidth	S Separation Minimum	Mounting Technique
0402	1005	1.00 (.040) ±0.05 (.002)	0.50 (.020) ±0.05 (.002)		0.30 (.012) ±0.10 (.004)	0.30 (.012)	Solder Reflow Only
0603	1608	1.60 (.063) ±0.15 (.006)	0.80 (.032) ±0.15 (.006)		0.35 (.014) ±0.15 (.006)	0.70 (.028)	
0805	2012	2.00 (.079) ±0.20 (.008)	1.25 (.049) ±0.20 (.008)		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)		
1210 ¹	3225	3.20 (.126) ±0.20 (.008)	2.50 (.098) ±0.20 (.008)	See Table 2	0.50 (0.02) ±0.25 (.010)		
1808	4520	4.70 (.185) ±0.50 (.020)	2.00 (.079) ±0.20 (.008)	for Thickness	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)	N/A	
1825	4564	4.50 (.177) ±0.30 (.012)	6.40 (.252) ±0.40 (.016)		0.60 (.024) ±0.35 (.014)		Solder Reflow Only
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)		

¹ For capacitance values \geq 12 μ F add 0.02 (0.001) to the width tolerance dimension and 0.10 (0.004) to the legth tolerance dimension.

Qualification/Certification

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

Environmental Compliance

Lead (Pb)-Free, RoHS, and REACH compliant without exemptions (excluding SnPb termination finish option).





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 % Capacitance Loss/Decade Hour)	3.0%
Dielectric Withstanding Voltage (DWV)	250% of rated voltage (5 ±1 second and charge/discharge not exceeding 50 mA)
Dissipation Factor (DF) Maximum Limit @ 25°C	See Dissipation Factor (DF) Limits Table
Insulation Resistance (IR) Limit @ 25°C	See Insulation Resistance Limit Table (Rated voltage applied for 120 ±5 seconds @ 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 $M\Omega$ - μ F value by the capacitance and compare to $G\Omega$ limit. Select the lower of the two limits.

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

1 kHz ±50 Hz and 1.0 ±0.2 Vrms if capacitance \leq 10 μ F

120 Hz ±10 Hz and 0.5 ±0.1 Vrms if capacitance > 10 μ F

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 (X7R Dielectric)

EIA Case Size	1,000 Megohm Microfarads or 100 GΩ	500 Megohm Microfarads or 10 GΩ
0201	N/A	ALL
0402	< 0.012 µF	≥ 0.012 µF
0603	< 0.047 µF	≥ 0.047 µF
0805	< 0.047 µF	≥ 0.047 µF
1206	< 0.22 µF	≥ 0.22 µF
1210	< 0.39 µF	≥ 0.39 µF
1808	ALL	N/A
1812	< 2.2 µF	≥ 2.2 µF
1825	ALL	N/A
2220	< 10 µF	≥ 10 µF
2225	ALL	N/A



Dissipation Factor (DF) Limits Table

EIA Case Size	Rated DC Voltage	Capacitance	Dissipation Factor
	< 16		5.0%
0402	16/25	All	3.5%
	> 25		2.5%
	< 16		5.0%
	16/25	< 1.0 uF	3.5%
0603	> 25		2.5%
	< 16	≥ 1.0 uF	10.0%
	16/25	≥ 1.0 ur	10.0%
	< 16	≤ 2.2 µF	5.0%
	16/25	≤ 2.2 μr	3.5%
0805	> 25	< 1.0 µF	2.5%
0005	< 16	> 2.2 µF	
	16/25	2.2 μr	10.0%
	> 25	≥ 1.0 µF	
	< 16		5.0%
	16/25	< 10 µF	3.5%
1206	> 25		2.5%
	< 16	≥ 10 µF	10.0%
	16/25	2 10 μi	10.0 /0
	< 16		5.0%
	16/25	< 22 µF	3.5%
1210	> 25		2.5%
	< 16	> 22E	10.0%
	16/25	≥ 22 µF	10.0 /0
	< 16		5.0%
1812 – 2225	16/25	All	3.5%
	> 25		2.5%

Post Environmental Limits

	High Tempo	erature Life, E	Biased Humid	lity, Moisture	Resistance	
Dielectric	Case Size	Rated DC Voltage	Capacitance Value	Dissipation Factor (Maximum %)	Capacitance Shift	Insulation Resistance
		< 16		7.5		
	0402	16/25	All	5.0		
		> 25		3.0		
		< 16		7.5		
		16/25	< 1.0 uF	5.0		
	0603	> 25		3.0		
		< 16	≥ 1.0 uF	20.0		
		16/25	≥ 1.0 uF	20.0		
		< 16	< 2.2 JUE	7.5		
		16/25	≤ 2.2 µF	5.0		
	0805	> 25	< 1.0 µF	3.0		
	0005	< 16	> 2.2 µF			
		16/25	- 2.2 μr	20.0		
X7R		> 25	≥ 1.0 µF		±20%	10% of Initial Limit
		< 16		7.5		
		16/25	< 10 µF	5.0		
	1206	> 25		3.0		
		< 16	≥ 10 µF	20.0		
		16/25	≥ 10 µF	20.0		
		< 16		7.5		
		16/25	< 22 µF	5.0		
	1210	> 25		3.0		
		< 16	≥ 22 µF	20.0		
		16/25	= 22 μr	20.0		
		< 16		7.5		
	1808 – 2225	16/25	All	5.0		
		> 25		3.0		



Table 1A – Capacitance Range/Selection Waterfall (0402 – 1206 Case Sizes)

			se Si ierie			С)40	2C				C)60	3C						C	080	5C							C	120	6C			
Сар	Сар		tage C		9	8	4	3	5	9	8	4	3	5	1	2	9	8	4	3	6	5	1	2	Α	9	8	4	3	6	5	1	2	Α
Cap	Code		ed Volt		6.3	9	16	25	50	6.3	9	16	25	50	10	200	6.3	9	16	25	35	50	10	200	250	6.3	ę	16	25	35	50	<u>1</u> 0	200	250
			(VDC) Tolera		-		Prod		Ava		bilit	y a						s Co	ode	s – 1	See							ckne						
10 – 91 pF*	100 – 910*	J	K	М	BB	BB	BB	BB	BB	CB	CB	СВ	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	EB	EB	EB	
100 – 150 pF**	101 – 151**	J	K K	M M	BB BB	BB BB	BB BB	BB BB	BB BB	CB CB	CB CB	CB CB	CB CB	CB CB	CB CB	CB CB		DC DC		DC DC	DC DC	DC DC	DC DC	DC	DC	EB EB	EB	EB EB	EB EB	EB EB	EB	EB EB	EB EB	
180 – 820 pF** 1000pF	181 – 821** 102	J	K	M	BB	BB	BB	BB	BB	CB	CB	СВ	CB	CF	СВ	CF		DC		DC	DC	DC	DC	DC DC	DC	EB	EB EB	EB	EB	EB	EB EB	EB	EB	EB
1200 pF	122	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC		DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB	EB
1500 pF	152	J	К	М	BB	BB	BB	BB	BB	CB	CB	СВ	CB	СВ	CB	СВ		DC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB	EB
1800 pF 2200 pF	182 222	J	K K	M	BB BB	BB BB	BB BB	BB BB	BB BB	CB CB	CB CB	CB CB	CB CB	CB CF	CB CB		DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB
2200 pF 2700 pF	272	J	K	M	BB	BB	BB	BB	BB	СВ	CB	CB	CB	CF	CF		DC	DC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB	EB
3300 pF	332	J	ĸ	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB	EB
3900 pF	392	J	K	М	BB	BB	BB	BB	BB	СВ	СВ	CB	СВ	СВ				DC	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB	EB
4700 pF	472	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	DC	DC	EB	EB		EB	EB	EB	EB	EB	EB
5600 pF 6800 pF	562 682	J	K K	M M	BB BB	BB BB	BB BB	BB BB	BB BB	CB CB	CB CB	CB CB	CB CB	CB CB	CB CB	CB CB	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB
8200 pF	822	J	ĸ	M	BB	BB	BB	BB	BB	СВ	СВ	СВ	СВ	СВ	СВ	СВ		DC		DC	DC		DC	DC	DC	EB	EB		EB	EB	EB	EB	EB	EB
10000 pF	103	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CF	CF		DC	DC	DC	DC	DC	DC	DC	DC	DC	EB	EB	_	EB	EB	EB	EB	EB	EB
12000 pF	123	J	К	М	BB	BB	BB	BB	BB	СВ	СВ	СВ	CB	СВ	CB		DC	DC	DC	DC	DC	DC	DC	DC	DC	EB	EB		EB	EB	EB	EB	EB	EB
15000 pF	153	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	DC	DC	DC	EB	EB		EB	EB	EB	EB	EB	EB
18000 pF 22000 pF	183 223	J	K K	M	BB BB	BB BB	BB BB	BB BB	BB BB	CB CB	CB CB	CB CB	CB CB	CB CF	CB CF		DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	DC DC	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB	EB EB
27000 pF	273	J	K	M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	DD	DE	00	EB	EB	EB	EB	EB	EB	EB	EB	EB
33000 pF	333	J	К	М	BB	BB	BB	BB		СВ	СВ	CB	CF	СВ	CB		DC	DC	DC	DC	DC	DC	DD	DE		EB	EB	EB	EB	EB	EB	EB	EB	EB
39000 pF	393	J	K	М	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC		DC	DC	DC	DC	DD	DE		EB	EB	EB	EB	EB	EB	EC	EB	EB
47000 pF	473 563	J	K K	M M	BB BB	BB	BB BB	BB		CB CB	CB	CB CB	CB	CF CB	CB		DC DD	DC DD	DC	DC DD	DC DD	DC	DE	DG		EB	EB EB	EB	EB EB	EB EB	EB	EC	ED ED	ED
56000 pF 68000 pF	683	J	ĸ	M	BB	BB BB	BB			CB	CB CB	СВ	CB CB	CF			DD	DD	DD DD	DD	DD	DD DD	DE DE	DG		EB EB	EB	_	EB	EB	EB EB	EB EB	ED	ED ED
82000 pF	823	Ĵ	ĸ	M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DD	DE			EB	EB	EB	EB	EB	EB	EB	ED	ED
0.1 µF	104	J	К	М	BB	BB	BB			СВ	СВ	CF	СВ	CF			DC	DC	DC	DC	DC	DC	DE			EB	EB	EB	EB	EB	EB	EB	EM	EM
0.12 µF	124	J	K	M						CB	CB	CB	CB	CB			DC	DC	DC	DC	DD	DD	DG			EC	EC		EC	EC	EC	EC	EG	
0.15 μF 0.18 μF	154 184	J	K K	M						CB CB	CB CB	CB CB	CB CB	CB			DC DC	DC DC	DC DC	DC DC	DD DG	DD DG	DG DG			EC EC	EC EC	_	EC EC	EC EC	EC EC	EC EC	EG	
0.10 µľ 0.22 µF	224	J	K	M						CB	CB	CB	CB				DC	DC	DC	DC	DG		DG			EC	EC		EC	EC	EC	EC		
0.27 µF	274	J	K	M						CB	CB	CB	0.0				DD	DD		DD		DD				EB	EB	EB	EB	EC	EC	EM		
0.33 µF	334	J	К	М						СВ	СВ	СВ					DG				DD					EB	EB	EB	EB	EC	EC	EG		
0.39 µF	394	J	K	M						CB	CB	CB					DG	DG		DG	DE	DE				EB	EB	EB	EB	EC	EC	EG		
0.47 μF 0.56 μF	474 564	J	K K	M						СВ	CB	СВ					DG DD	DG DD	DG DD	DG DG	DE DH	DE DH				EC ED	EC ED		EC ED	EC EC	EC EC	EG		
0.68 µF	684	J	K	M													DD	DD	DD		DH					EE	EE		EE	ED	ED			
0.82 µF	824	J	К	М													DD	DD	DD	DG						EF	EF	EF	EF	ED	ED			
1 µF	105	J	K	М						CC1	CC1	CC1	CD1				DD	DD	DD	DG	DG ¹	DG1				EF	EF	EF	EH	ED	ED			_
1.2 µF	125 155	J	K K	M M														DE DG								ED ED	ED ED		EG EG		EH EH			
1.5 μF 1.8 μF	185	J	ĸ	M														DG								ED		ED	EG		EH			
2.2 µF	225	Ĵ	ĸ	M														DG								ED	ED	ED	EF		EH			
2.7 µF	275	J	К	М																						EN		EN						
3.3 µF	335	J	K	M																						ED		ED						
3.9 μF 4.7 μF	395 475	J	K K	M														DG ¹	DG1							EF EF								
4.7 μi 5.6 μF	565	J	K	M														50	20							EH								
6.8 µF	685	J	К	М																						EH	EH	EH						
8.2 µF	825	J	K	M														DO								EH								
10 μF 22 μF	106 226	J	K K	M													DG1	DG1											EH1					
μ	220		ed Volt	tage	6.3	9	16	25	50	6.3	ę	16	25	50	1 <u>0</u>	200	6.3	9	9	25	35	50	100	200	250	6.3			3	5	.02	8	8	250
Сар	Сар		(VDC)		-																													
Cap	Code	Ca	tage C se Si	ze/	9	8 C	4 0402	3 2C	5	9	8	4 C(3 060:	5 3C	1	2	9	8	4	3 C	6 080	5 5C	1	2	A	9	E EF EH EH				A			
*Concoitono			Serie:		Ļ																		- 10	17		L	C1206C							

*Capacitance range Includes E24 decade values only. (i.e., 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82 and 91) **Capacitance range Includes E12 decade values only. (i.e., 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68 and 82) xx¹ Available only in K, M tolerance.

xx² Available only in M tolerance.



Table 1B – Capacitance Range/Selection Waterfall (1210 – 2225 Case Sizes)

	Con		se Si Serie				(C12	100	;			C 1	808	BC		C 1	1812	2 C		(C18	250)		C	222	0C		(C22	250)
Сар	Cap Code	Vol	tage C	ode	9	8	4	3	5	1	2	A	5	1	2	3	5	1	2	A	5	1	2	A	3	5	1	2	A	5	1	2	A
	Code	Rat	ed Volt (VDC)	-	6.3	9	16	25	20	100	200	250	50	100	200	25	50	1 0	200	250	50	100	200	250	25	20	9	200	250	20	6	200	250
		Сар	Tolera	ance		Pr	odu	ct A	Vai	labi	ility	and	d Ch	nip T	Thic	kne	ss	Cod	les -	- Se	e Ta	able	92 f	or C	Chip	Th	ickr	ies	s Di	mer	nsio	ns	
10 – 91 pF*	100 – 910*	J	K	M	FB	FB	FB	FB	FB	FB	FB																						
100 – 270 pF**	101 – 271**	J	K	M	FB	FB	FB	FB	FB	FB	FB																						
330 pF	331	J	K	M	FB	FB	FB	FB	FB	FB	FB		LF	LF	LF																		
390 pF	391	J	K	M	FB	FB	FB	FB	FB	FB	FB		LF	LF	LF																		
470 – 1,200 pF**	471 – 122**	J	K	M	FB	FB	FB	FB	FB	FB	FB		LF	LF	LF	GB	GB	GB	GB														
1,500 pF	152	J	K	М	FB	FB	FB	FB	FB	FB	FE		LF	LF	LF	GB	GB	GB	GB														
1,800 pF	182	J	К	M	FB	FB	FB	FB	FB	FB	FE		LF	LF	LF	GB	GB	GB	GB														
2,200 pF	222	J	К	M	FB	FB	FB	FB	FB	FB	FB	FB	LF	LF	LF	GB	GB	GB	GB														
2,700 pF	272	J	к	М	FB	FB	FB	FB	FB	FB	FB	FB	LF	LF	LF	GB	GB	GB	GB														
3,300 pF	332	J	к	М	FB	FB	FB	FB	FB	FB	FB	FB	LF	LF		GB	GB	GB	GB														
3,900 pF	392	J	К	М	FB	FB	FB	FB	FB	FB	FB	FB	LF	LF		GB	GB	GB	GB		HB	HB	HB										
4,700 pF	472	J	К	M	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GD		ΗВ	HB	HB							KE	KE	KE	
5,600 pF	562	J	К	M	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GH		ΗВ	HB	HB							KE	KE	KE	
6,800 pF	682	J	К	М	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB	GB	ΗВ	HB	HB		JE	JE	JE			KE	KE	KE	
8,200 pF	822	J	К	М	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB	GB	ΗВ	HB	ΗВ		JE	JE	JE			KE	KE	KE	
10,000 pF	103	J	К	М	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB	GB	ΗВ	HB	HE		JE	JE	JE			KE	KE	KE	
12,000 pF	123	J	к	м	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB	GB	ΗВ	НВ	HE		JE	JE	JE			KE	KE	KE	
15,000 pF	153	J	к	м	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB	GB	НВ	НВ			JE	JE	JE			KE	KE	KE	
18,000 pF	183	J	к	м	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB	GB	ΗВ	HE			JE	JE	JE			KE	KE		
22,000 pF	223	J	K	M	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	GB	HB	HB	НВ	НВ	JE	JE	JE			KE	KE		
27,000 pF	273	J	К	М	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	GB	HB	HB	HB	HB	JE	JE	JE			KE	KE		
33,000 pF	333	J	к	м	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB		ΗВ	НВ	НВ	НВ	JB	JB	JB			KE			
39,000 pF	393	J	к	м	FB	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	GB	ΗВ	НВ	НВ	НВ	JB	JB	JB						
47,000 pF	473	J	K	M	FB	FB	FB	FB	FB	FB	FC	FC	LD	LD		GB	GB	GB	GB	GB	HB	HB	HB	HB	JB	JB	JB						
56,000 pF	563	J	K	M	FB	FB	FB	FB	FB	FB	FC	FC	LD	LD		GB	GB	GB	GB	GB	НВ	HB	HB	HB	JB	JB	JB						
68,000 pF	683	J	K	M	FB	FB	FB	FB	FB	FB	FC	FC	LD			GB	GB	GB	GB	GB	HB	HB	HB	HB	JB	JB	JB						
82,000 pF	823	J	ĸ	M	FB	FB	FB	FB	FB	FC	FF	FF	LD			GB	GB	GB	GB	GB	НВ	HB	HB	HB	JC	JC	JC	JC	JC				
0.10 µF	104	J.	ĸ	M	FB	FB	FB	FB	FB	FD	FG	FG	LD			GB	GB	GB	GB	GB	НВ	HB	HB	HB	JC	JC	JC	JC	JC	кс	кс	кс	кс
0.12 µF	124	Ĵ	ĸ	M	FB	FB	FB	FB	FB	FD	10	10	LD			GB	GB	GB	GB	GB	НВ	HB	HB	HB	JC	JC	JC	JC	JC	кс	KC	KC	KC
0.12 µr 0.15 µF	154	J	ĸ	M	FC	FC	FC	FC	FC	FD			LD			GB	GB	GB	GE	GE	НВ	HB	HB	HB	JC	JC	JC	JC	JC	кс	KC	KC	KC
0.18 µF	184	J	K	M	FC	FC	FC	FC	FC	FD			LD			GB	GB	GB		GG		HB	HB	HB	JC	JC	JC	JC	JC	KC	KC	KC	KC
0.18 µP 0.22 µF	224	1	K	M	FC	FC	FC	FC	FC	FD						GB	GB	GB		GG		НВ	НВ	НВ	JC	JC	JC	JC	JC	KC	KC	KC	KC
0.22 μF 0.27 μF	274	1	K	M	FC	FC	FC	FC	FC	FD						GB	GB	GG	GG	GG	НВ	НВ	НВ	НВ	JC	JC	JC	JC	JC	KB	KC	KC	KC
0.27 μF 0.33 μF	334	J	K	M	FD	FD	FD	FD	FD	FD						GB	GB	GG		GG		НВ	НВ	НВ	JC	JC	JC	JC	JC	KB	KC	KC	KC
0.35 µF 0.39 µF	334 394	1	K	M	FD	FD	FD	FD	FD	FD						GB	GB		GG			НВ	HD	HD	JC	JC	JC	JC	JC	KB	KC	KC	KC
0.39 μF 0.47 μF	394 474	J	K	M	FD	FD		_	FD	FD											НВ				JC	JC	JC	JC	_	KB		_	
0.47 μF 0.56 μF	474 564	J	K	M	FD	FD		FD	FD	FD							GC		33	31		нb		HD	JC	JC	JC	JD	JD			KD	1
0.56 µF 0.68 µF	564 684	J	K	M	FD				FD								GC					HD			JC	JC	JD	JD				1	
		J				FF	FD			FG												HD	HD		JC	JC	JF	JF	JD			1	
0.82 µF	824 105	J	K	M	FF			FF	FF							GE	GE GE					HF		HF					JF	KB	KC		
1.0 µF	105	J	K	M	FY			_	FY	ΓIVI						GE	GE	66				ΠF	ПF	٦F	JC	JC	JF	JF	JF	KB	_	KE KE	
1.2 µF	125	J	K	M	FH			FH													HB				JC	JC				KB	NE	NE.	NE
1.5 µF	155 185	J	K K	M	FH	FH FH		FH													HC HD				JC	JC				KC KD			
1.8 µF	00	Rat	ed Volt		FH 9:3	PH 2	19 19	25 HJ	20	100	200	250	50	100	200	25	50	100	200	250	20 20	100	200	250	25 C	50 1D	100	200	250	KU 05	100	200	250
Can	Сар	v.,	(VDC)																														
Сар	Code		tage C		9	8	4	3	5	1	2	A	5	1	2	3	5	1	2	A	5	1	2	A	3	5	1	2	A	5	1	2	A
			se Si Serie					C12	10C				C,	808	SC		C [,]	1812	2C			C18	250	;		C	222	0C			C22	250	;

*Capacitance range Includes E24 decade values only. (i.e., 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82 and 91)

**Capacitance range Includes E12 decade values only. (i.e., 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68 and 82)

xx¹ Available only in K, M tolerance.

xx² Available only in M tolerance.



Table 1B – Capacitance Range/Selection Waterfall (1210 – 2225 Case Sizes) cont'd

	Can		se S Serie				(C12	100)			C1	808	BC		C 1	1812	2C		(C18	250	0		C	222	OC		(222	250	0
Сар	Сар	Vol	tage C	ode	9	8	4	3	5	1	2	Α	5	1	2	3	5	1	2	A	5	1	2	A	3	5	1	2	A	5	1	2	A
	Code	Rat	ed Voli (VDC)		6.3	9	16	25	50	100	200	250	50	100	200	25	50	100	200	250	50	100	200	250	25	50	100	200	250	50	100	200	250
		Сар	Tolera	ance		Pr	odu	ct A	Avai	labi	lity	and	d Ch	ip 1	Γhic	kne	ss	Cod	les	– Se	e T	able	9 2 f	or (Chip	Th	ickr	ness	s Di	mer	nsio	ns	
2.2 µF	225	J	K	M	FJ	FJ	FJ	FJ	FG	FT ¹						GO	GO	GO ¹			HF				JF	JF				KD			
2.7 µF	275	J	K	M	FE	FE	FE	FG	FH																								
3.3 µF	335	J	K	M	FF	FF	FF	FM	FM																								
3.9 µF	395	J	K	M	FG	FG	FG	FG	FK																								
4.7 µF	475	J	K	M	FC	FC	FC	FG	FS							GK	GK								JF	JF							
5.6 µF	565	J	K	M	FF	FF	FF	FH																									
6.8 µF	685	J	K	M	FG	FG	FG	FM																									
8.2 µF	825	J	K	M	FH	FH	FH	FK																									
10 µF	106	J	K	M	FY1	FY	FY	FS								GK									JF	JO							
12 µF	126	J	K	M																													
15 µF	156	J	K	M	FΜ	FM																			JO	JO							
18 µF	186	J	K	M																													
22 µF	226	J	K	M	FS	FS	FS ²	FS ²																	JO								
47 µF	476	J	K	M	FS²																												
		Rat	ed Voli (VDC)	•	6.3	6	16	25	50	100	200	250	50	100	200	25	50	100	200	250	50	100	200	250	25	50	100	200	250	50	100	200	250
Сар	Cap Code	Vol	tage C	ode	9	8	4	3	5	1	2	A	5	1	2	3	5	1	2	A	5	1	2	A	3	5	1	2	A	5	1	2	A
		-	se Si Serie					C12	10C	;			C1	808	BC		C,	1812	2C			C18	25C	;		C	2220	C			C22	250	;

*Capacitance range Includes E24 decade values only. (i.e., 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82 and 91) **Capacitance range Includes E12 decade values only. (i.e., 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68 and 82)

xx¹ Available only in K, M tolerance.

xx² Available only in M tolerance.

Table 2 – Chip Thickness/Packaging Quantities

Thickness	Case	Thickness ±	Paper C	Quantity	Plastic (Quantity
Code	Size	Range (mm)	7" Reel	13" Reel	7" Reel	13" Reel
BB	0402	0.50 ± 0.05	10,000	50,000	0	0
CB	0603	0.80 ± 0.07	4,000	10,000	0	0
CF	0603	0.80 ± 0.07*	4,000	15,000	0	0
CC	0603	0.80 ± 0.10	4,000	10,000	0	0
CD	0603	0.80 ± 0.15	4,000	10,000	0	0
DC	0805	0.78 ± 0.10	4,000	10,000	0	0
DD	0805	0.90 ± 0.10	4,000	10,000	0	0
DE	0805	1.00 ± 0.10	0	0	2,500	10,000
DG	0805	1.25 ± 0.15	0	0	2,500	10,000
DH	0805	1.25 ± 0.20	0	0	2,500	10,000
EB	1206	0.78 ± 0.10	4,000	10,000	4,000	10,000
EC	1206	0.90 ± 0.10	0	0	4,000	10,000
EN	1206	0.95 ± 0.10	0	0	4,000	10,000
ED	1206	1.00 ± 0.10	0	0	2,500	10,000
EE	1206	1.10 ± 0.10	0	0	2,500	10,000
Thickness	Case	Thickness ±	7" Reel	13" Reel	7" Reel	13" Reel
Code	Size	Range (mm)	Paper C	Juantity	Plastic (Quantity

Package quantity based on finished chip thickness specifications.



Table 2 – Chip Thickness/Packaging Quantities cont'd

Thickness	Case	Thickness ±	Paper G	Quantity	Plastic (Quantity
Code	Size	Range (mm)	7" Reel	13" Reel	7" Reel	13" Reel
EF	1206	1.20 ± 0.15	0	0	2,500	10,000
EM	1206	1.25 ± 0.15	0	0	2,500	10,000
EG	1206	1.60 ± 0.15	0	0	2,000	8,000
EH	1206	1.60 ± 0.20	0	0	2,000	8,000
FB FC	1210 1210	0.78 ± 0.10 0.90 ± 0.10	0	0	4,000 4,000	10,000 10,000
FD	1210	0.90 ± 0.10 0.95 ± 0.10	0	0	4,000	10,000
FE	1210	1.00 ± 0.10	Ő	Ő	2,500	10,000
FF	1210	1.10 ± 0.10	Ő	Ő	2,500	10,000
FG	1210	1.25 ± 0.15	Ő	Ő	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
FJ	1210	1.85 ± 0.20	0	0	2,000	8,000
FT	1210	1.90 ± 0.20	0	0	1,500	4,000
FY	1210	2.00 ± 0.20	0	0	2,000	8,000
FK	1210	2.10 ± 0.20	0	0	2,000	8,000
FS	1210	2.50 ± 0.30	0	0	1,000	4,000
NA	1706	0.90 ± 0.10	0	0	4,000	10,000
NC	1706	1.00 ± 0.15	0	0	4,000	10,000
LD LF	1808 1808	0.90 ± 0.10 1.00 ± 0.15	0 0	0	2,500 2,500	10,000 10,000
GB	1808	1.00 ± 0.15 1.00 ± 0.10	0	0 0	2,500	4,000
GC	1812	1.00 ± 0.10 1.10 ± 0.10	0	0	1,000	4,000
GD	1812	1.25 ± 0.15	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
GG	1812	1.55 ± 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
GO	1812	2.50 ± 0.20	0	0	500	2,000
HB	1825	1.10 ± 0.15	0	0	1,000	4,000
HC	1825	1.15 ± 0.15	0	0	1,000	4,000
HD	1825	1.30 ± 0.15	0	0	1,000	4,000
HE	1825	1.40 ± 0.15	0	0	1,000	4,000
HF	1825	1.50 ± 0.15	0	0	1,000	4,000
JB JC	2220 2220	1.00 ± 0.15 1.10 ± 0.15	0 0	0 0	1,000 1,000	4,000 4,000
JD	2220	1.10 ± 0.15 1.30 ± 0.15	0	0	1,000	4,000 4,000
JE	2220	1.30 ± 0.15 1.40 ± 0.15	0	0	1,000	4,000
JF	2220	1.50 ± 0.15	0	0	1,000	4,000
JO	2220	2.40 ± 0.15	Ő	Ő	500	2,000
KB	2225	1.00 ± 0.15	0	0	1,000	4,000
KC	2225	1.10 ± 0.15	0	0	1,000	4,000
KD	2225	1.30 ± 0.15	0	0	1,000	4,000
KE	2225	1.40 ± 0.15	0	0	1,000	4,000
Thickness	Case	Thickness ±	7" Reel	13" Reel	7" Reel	13" Reel
Code	Size	Range (mm)	Paper G	Quantity	Plastic (Quantity
			1		1	

Package quantity based on finished chip thickness specifications.



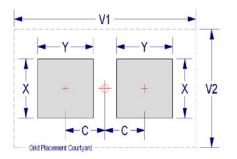
Table 3 – Chip Capacitor Land Pattern Design Recommendations per IPC–7351

EIA Size Code	Metric Size Code			sity Lev mum (I rotrusio	Most))		Media	sity Lev an (Nor rotrusio)			sity Lev mum (L rotrusio	.east))
		С	Y	X	V1	V2	С	Y	X	V1	V2	С	Y	X	V1	V2
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
1210 ¹	3225	1.50	1.60	2.90	5.60	3.90	1.40	1.40	2.80	4.70	3.30	1.30	1.20	2.70	4.00	3.00
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

¹ Only for capacitance values $\geq 22 \,\mu F$

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 Reflow Soldering Profile:

KEMET's families of surface mount multilayer ceramic capacitors (SMD MLCCs) are compatible with wave (single or dual), convection, IR or vapor phase reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J-STD-020 standard for moisture sensitivity testing. These devices can safely withstand a maximum of three reflow passes at these conditions.

Profile Feature	Terminati	on Finish	
	SnPb	100% Matte Sn	
Preheat/Soak			
Temperature Minimum (T _{Smin})	100°C	150°C	
Temperature Maximum (T _{Smax})	150°C	200°C	
Time (t _s) from T_{Smin} to T_{Smax}	60 – 120 seconds	60 – 120 seconds	
Ramp-Up Rate $(T_L \text{ to } T_P)$	3°C/second maximum	3°C/second maximum	
Liquidous Temperature (T_L)	183°C	217°C	
Time Above Liquidous (t_L)	60 – 150 seconds	60 – 150 seconds	
Peak Temperature (T _P)	235°C	260°C	
Time Within 5°C of Maximum Peak Temperature (t _P)	20 seconds maximum	30 seconds maximum	
Ramp-Down Rate $(T_P \text{ to } T_L)$	6°C/second maximum	6°C/second maximum	
Time 25°C to Peak Temperature	6 minutes maximum	8 minutes maximum	

Note 1: All temperatures refer to the center of the package, measured on the capacitor body surface that is facing up during assembly reflow.

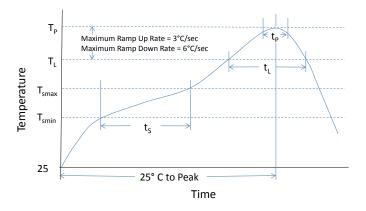


Table 4 – Performance & Reliability: Test Methods and Conditions

Stress	Reference	Test or Inspection Method
Terminal Strength	JIS-C-6429	Appendix 1, Note: Force of 1.8 kg for 60 seconds.
Board Flex	JIS-C-6429	Appendix 2, Note: Standard termination system – 2.0 mm (minimum) for all except 3 mm for C0G. Flexible termination system – 3.0 mm (minimum).
		Magnification 50 X. Conditions:
Solderability	J-STD-002	a) Method B, 4 hours @ 155°C, dry heat @ 235°C
Solderability	J-51D-002	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 rated voltage. Add 100 K ohm resistor. Measurement at 24 hours +/- 2 hours after test conclusion. Low Volt Humidity: 1,000 hours 85°C/85% RH and 1.5 V. Add 100 K 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 /EIA-198	1,000 hours at 125°C (85°C for X5R, Z5U and Y5V) with 2 X rated voltage applied.
Storage Life	MIL-STD-202 Method 108	150°C, 0 VDC for 1,000 hours.
Vibration	MIL-STD-202 Method 204	5 g's for 20 min., 12 cycles each of 3 orientations. Note: Use 8" X 5" PCB 0.031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz
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.

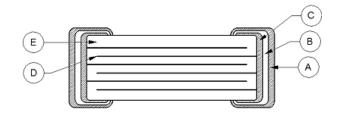
Storage & Handling

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 40°C 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	lt	Material	
А		Finish	100% Matte Sn
В	Termination System	Barrier Layer	Ni
С	- ,	Base Metal	Cu
D	Inner E	Ni	
E	Dielectri	BaTiO ₃	



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

Capacitor Marking (Optional):

These surface mount multilayer ceramic capacitors are normally supplied unmarked. If required, they can be marked as an extra cost option. Marking is available on most KEMET devices but must be requested using the correct ordering code identifier(s). If this option is requested, two sides of the ceramic body will be laser marked with a "K" to identify KEMET, followed by two characters (per EIA–198 - see table below) to identify the capacitance value. EIA 0603 case size devices are limited to the "K" character only. Marking appears in legible contrast. Illustrated below is an example of an MLCC with laser marking of "KA8", which designates a KEMET device with rated capacitance of 100 μ F. Orientation of marking is vendor optional.



Laser marking option is <u>not</u> available on:

- C0G, Ultra Stable X8R and Y5V dielectric devices
- EIA 0402 case size devices
- EIA 0603 case size devices with Flexible Termination option.
- KPS Commercial and Automotive Grade stacked devices.

Capacitance (pF) For Various Alpha/Numeral Identifiers												
Aliaha						Numera	al					
Alpha	9	0	1	2	3	4	5	6	7	8		
Character	Capacitance (pF)											
А	0.1	10	10	100	1,000	10,000	100,000	1,000,000	10,000,000	100,000,000		
В	0.11	1.1	11	110	1,100	11,000	110,000	1,100,000	11,000,000	110,000,000		
С	0.12	12	12	120	1,200	12,000	120,000	1,200,000	12,000,000	120,000,000		
D	0.13	13	13	130	1,300	13,000	130,000	1,300,000	13,000,000	130,000,000		
E	0.15	15	15	150	1,500	15,000	150,000	1,500,000	15,000,000	150,000,000		
F	0.16	16	16	160	1,600	16,000	160,000	1,600,000	16,000,000	160,000,000		
G	0.18	18	18	180	1,800	18,000	180,000	1,800,000	18,000,000	180,000,000		
Н	0.2	20	20	200	2,000	20,000	200,000	2,000,000	20,000,000	200,000,000		
J	0.22	22	22	220	2,200	22,000	220,000	2,200,000	22,000,000	220,000,000		
К	0.24	2.4	24	240	2,400	24,000	240,000	2,400,000	24,000,000	240,000,000		
L	0.27	2.7	27	270	2,700	27,000	270,000	2,700,000	27,000,000	270,000,000		
М	0.3	30	30	300	3,000	30,000	300,000	3,000,000	30,000,000	300,000,000		
N	0.33	33	33	330	3,300	33,000	330,000	3,300,000	33,000,000	330,000,000		
Р	0.36	36	36	360	3,600	36,000	360,000	3,600,000	36,000,000	360,000,000		
Q	0.39	39	39	390	3,900	39,000	390,000	3,900,000	39,000,000	390,000,000		
R	0.43	43	43	430	4,300	43,000	430,000	4,300,000	43,000,000	430,000,000		
S	0.47	4.7	47	470	4,700	47,000	470,000	4,700,000	47,000,000	470,000,000		
Т	0.51	5.1	51	510	5,100	51,000	510,000	5,100,000	51,000,000	510,000,000		
U	0.56	56	56	560	5,600	56,000	560,000	5,600,000	56,000,000	560,000,000		
V	0.62	62	62	620	6,200	62,000	620,000	6,200,000	62,000,000	620,000,000		
W	0.68	68	68	680	6,800	68,000	680,000	6,800,000	68,000,000	680,000,000		
Х	0.75	75	75	750	7,500	75,000	750,000	7,500,000	75,000,000	750,000,000		
Y	0.82	82	82	820	8,200	82,000	820,000	8,200,000	82,000,000	820,000,000		
Z	0.91	9.1	91	910	9,100	91,000	910,000	9,100,000	91,000,000	910,000,000		
а	0.25	2 5	25	250	2,500	25,000	250,000	2,500,000	25,000,000	250,000,000		
b	0.35	3 5	35	350	3,500	35,000	350,000	3,500,000	35,000,000	350,000,000		
d	0.4	4 0	40	400	4,000	40,000	400,000	4,000,000	40,000,000	400,000,000		
е	0.45	4 5	45	450	4,500	45,000	450,000	4,500,000	45,000,000	450,000,000		
f	0.5	50	50	500	5,000	50,000	500,000	5,000,000	50,000,000	500,000,000		
m	0.6	60	60	600	6,000	60,000	600,000	6,000,000	60,000,000	600,000,000		
n	0.7	70	70	700	7,000	70,000	700,000	7,000,000	70,000,000	700,000,000		
t	0.8	80	80	800	8,000	80,000	800,000	8,000,000	80,000,000	800,000,000		
у	0.9	90	90	900	9,000	90,000	900,000	9,000,000	90,000,000	900,000,000		



Tape & Reel Packaging Information

KEMET offers multilayer ceramic chip capacitors packaged in 8, 12 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.

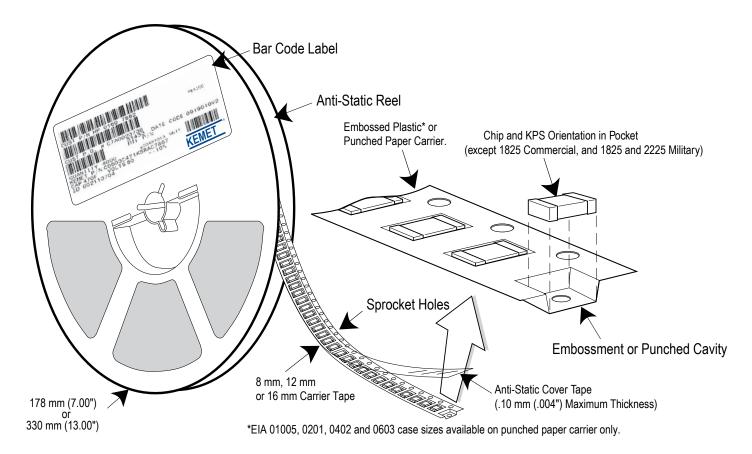


Table 5 – Carrier Tape Configuration – Embossed Plastic & Punched Paper (mm)

EIA Case Size	Tape Size (W)*	Pitch (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 Figures 1 & 2 for W and P₁ carrier tape reference locations. *Refer to Tables 6 & 7 for tolerance specifications.

Figure 1 – Embossed (Plastic) Carrier Tape Dimensions

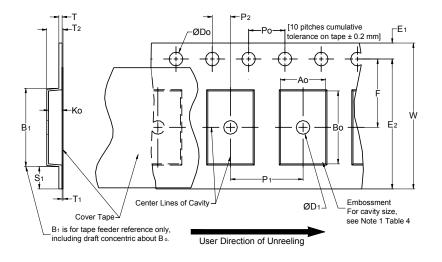


Table 6 – Embossed (Plastic) Carrier Tape Dimensions

Metric will govern

	Constant Dimensions — Millimeters (Inches)										
Tape Size	D ₀	D ₁ Minimum Note 1	E ₁	P ₀	P ₂	R Reference Note 2	S ₁ Minimum Note 3	T Maximum	T ₁ Maximum		
8 mm		1.0 (0.039)				25.0 (0.984)					
12 mm	1.5 +0.10/-0.0 (0.059 +0.004/-0.0)	1.5	1.75 ±0.10 (0.069 ±0.004)	4.0 ±0.10 (0.157 ±0.004)	2.0 ±0.05 (0.079 ±0.002)	30	0.600 (0.024)	0.600 (0.024)	0.100 (0.004)		
16 mm		(0.059)	.059)			(1.181)					
			Variable Dime	ensions — Mil	limeters (Inch	ies)					
Tape Size	Pitch	B ₁ Maximum Note 4	E ₂ Minimum	F	P ₁	T ₂ Maximum	W Maximum	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)				
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)	Note 5			
16 mm	Triple (12 mm)	12.1 (0.476)	14.25 (0.561)	7.5 ±0.05 (0.138 ±0.002)	12.0 ±0.10 (0.157 ±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 6).

3. If S₁ < 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. B, dimension is a reference dimension for tape feeder clearance only.

5. The cavity defined by A_{α} , B_{α} and K_{α} 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 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

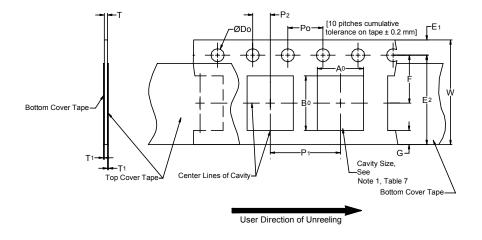


Table 7 – Punched (Paper) Carrier Tape Dimensions

Metric will govern

	Constant Dimensions — Millimeters (Inches)									
Tape Size	D0 E1 P0 P2 T1 Maximum G Minimum									
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 (0.004) Maximum	0.75 (0.030)	25 (0.984)			
	Variable Dimensions — Millimeters (Inches)									
Tape Size	Pitch	E2 Minimum	F	P ₁	T Maximum	W Maximum	A ₀ B ₀			
8 mm	Half (2 mm)	6.25	3.5 ±0.05	2.0 ±0.05 (0.079 ±0.002)	1.1	8.3 (0.327)	Note 1			
8 mm	Single (4 mm)	(0.246)	(0.138 ±0.002)	4.0 ±0.10 (0.157 ±0.004)	(0.098)	8.3 (0.327)				

1. The cavity defined by A_{α} , B_{α} 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.

c) rotation of the component is limited to 20° maximum (see Figure 3).

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 6).



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 to 1.0 Newton (10 to 100 gf)
12 and 16 mm	0.1 to 1.3 Newton (10 to 130 gf)

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

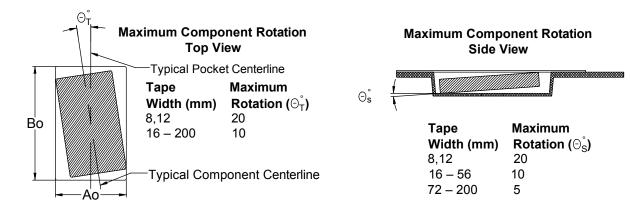


Figure 4 – Maximum Lateral Movement

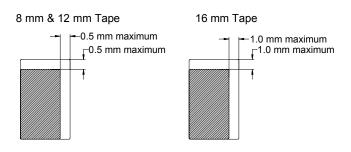


Figure 5 – Bending Radius

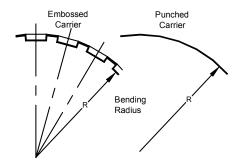
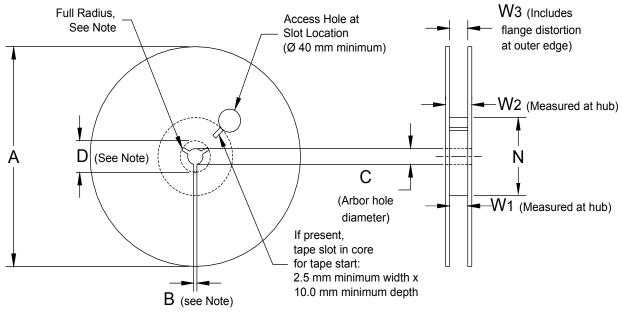


Figure 6 – Reel Dimensions



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	А	B Minimum C		D Minimum				
8 mm	178 ±0.20							
12 mm	(7.008 ±0.008) or	1.5 (0.059)	13.0 +0.5/-0.2 (0.521 +0.02/-0.008)	20.2 (0.795)				
16 mm	330 ±0.20 (13.000 ±0.008)	()	()	()				
	Variable	Dimensions — Millimeter	s (Inches)					
Tape Size	N Minimum	W ₁	W ₂ Maximum	W ₃				
8 mm		8.4 +1.5/-0.0 (0.331 +0.059/-0.0)	14.4 (0.567)					
12 mm	50 (1.969)	12.4 +2.0/-0.0 (0.488 +0.078/-0.0)	18.4 (0.724)	Shall accommodate tape width without interference				
16 mm		16.4 +2.0/-0.0 (0.646 +0.078/-0.0)	22.4 (0.882)					



Figure 7 – Tape Leader & Trailer Dimensions

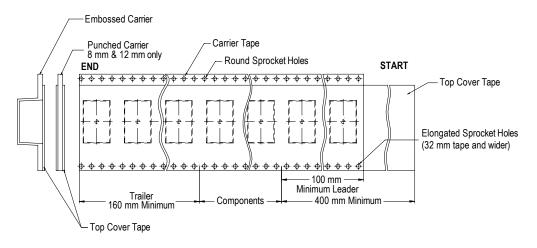
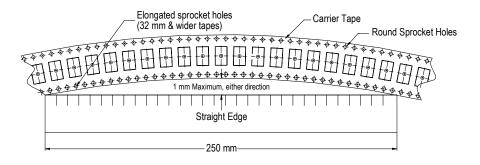
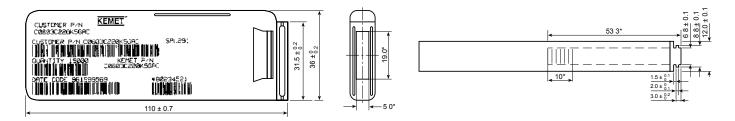


Figure 8 – Maximum Camber



Bulk Cassette Packaging (Ceramic Chips Only)

Meets Dimensional Requirements IEC–286 and EIAJ 7201 Unit mm *Reference



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 Pieces/Cassette
0402	1005	1.0 ±0.05	0.5 ±0.05	0.2 to 0.4	0.3	0.5 ±0.05	50,000
0603	1608	1.6 ±0.07	0.8 ±0.07	0.2 to 0.5	0.7	0.8 ±0.07	15,000

Surface Mount Multilayer Ceramic Chip Capacitors (SMD MLCCs) – X7R Dielectric, 6.3 – 250 VDC (Commercial Grade)



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