

Overview

KEMET's Automotive Grade Series surface mount capacitors in X7R dielectric are suited for a variety of applications requiring reliable operation. Whether under-hood or in-cabin, these devices emphasize the vital and robust nature of capacitors required 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.

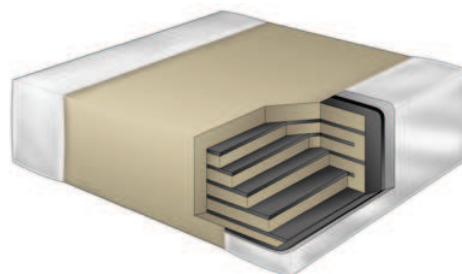
X7R dielectric features a 125°C maximum operating temperature and is considered "temperature stable." The Electronics Components, Assemblies and Materials Association (EIA) characterizes X7R dielectric as a Class II material. Components of this classification are fixed, ceramic dielectric capacitors 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

- AEC-Q200 automotive qualified
- -55°C to +125°C operating temperature range
- Pb-Free and RoHS Compliant
- Temperature stable dielectric
- EIA 0402, 0603, 0805, 1206, 1210, 1812, and 2220, 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 150 pF to 22 μ F
- 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

Applications

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



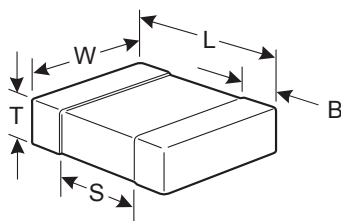
Ordering Information

C	0805	C	225	M	4	R	A	C	AUTO
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) ³
	0402 0603 0805 1206 1210 1812 2220	C = Standard	2 Significant Digits + Number of Zeros	J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$	9 = 6.3 V 8 = 10 V 4 = 16 V 3 = 25 V 5 = 50 V 1 = 100 V 2 = 200 V A = 250 V	R = X7R	A = N/A	C = 100% Matte Sn	AUTO = Automotive Grade 7" Reel Unmarked

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

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

Dimensions – Millimeters (Inches)



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)	See Table 2 for Thickness	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)	Solder Wave or Solder Reflow
0805	2012	2.00 (.079) ± 0.20 (.008)	1.25 (.049) ± 0.20 (.008)		0.50 (0.02) ± 0.25 (.010)	0.75 (.030)	
1206	3216	3.20 (.126) ± 0.20 (.008)	1.60 (.063) ± 0.20 (.008)		0.50 (0.02) ± 0.25 (.010)	N/A	Solder Reflow Only
1210	3225	3.20 (.126) ± 0.20 (.008)	2.50 (.098) ± 0.20 (.008)		0.50 (0.02) ± 0.25 (.010)		
1812	4532	4.50 (.177) ± 0.30 (.012)	3.20 (.126) ± 0.30 (.012)		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)		

Qualification/Certification

Automotive Grade products meet or exceed the requirements outlined by the Automotive Electronics Council. Details regarding test methods and conditions are referenced in document AEC–Q200, Stress Test Qualification for Passive Components. For additional information regarding the Automotive Electronics Council and AEC–Q200, please visit their website at www.aecouncil.com.

Environmental Compliance

Pb-Free and RoHS Compliant.



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 (Maximum % Capacitance Loss/Decade Hour)	3.0%
Dielectric Withstanding Voltage (DWV)	250% of rated voltage (5 ±1 seconds and charge/discharge not exceeding 50 mA)
Dissipation Factor (DF) Maximum Limit @ 25°C	5%(10 V), 3.5%(16 and 25 V) and 2.5%(50 to 250 V)
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 1,000 hours.

To obtain IR limit, divide $M\Omega \cdot \mu F$ 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 ≤ 10 μF

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

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	Dissipation Factor (Maximum %)	Capacitance Shift	Insulation Resistance
X7R	> 25	All	3.0	± 20%	10% of Initial Limit
	16/25		5.0		
	< 16		7.5		

Insulation Resistance Limit Table

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

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

Cap	Cap Code	Series			C0402					C0603							C0805										C1206									
		Voltage Code			9	8	4	3	5	9	8	4	3	5	1	2	9	8	4	3	5	1	2	A	9	8	4	3	5	1	2	A				
		Voltage DC			6.3	10	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250				
		Cap Tolerance			Product Availability and Chip Thickness Codes – See Table 2 for Chip Thickness Dimensions																															
10 – 91 pF	100 – 910	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	EB	EB						
100 – 150 pF	101 – 821	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	EB	EB						
180 – 820 pF	181	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						
1,000 pF	102	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					
1,200 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					
1,500 pF	152	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					
1,800 pF	182	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					
2,200 pF	222	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					
2,700 pF	272	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					
3,300 pF	332	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					
3,900 pF	392	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					
4,700 pF	472	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					
5,600 pF	562	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					
6,800 pF	682	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					
8,200 pF	822	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					
10,000 pF	103	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB					
12,000 pF	123	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB					
15,000 pF	153	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DD	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB				
18,000 pF	183	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DD	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB				
22,000 pF	223	J	K	M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DD	DC	DC	EB	EB	EB	EB	EB	EB	EB	EB				
27,000 pF	273	J	K	M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE		EB	EB	EB	EB	EB	EB	EB	EB				
33,000 pF	333	J	K	M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE		EB	EB	EB	EB	EB	EB	EB	EB				
39,000 pF	393	J	K	M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE		EB	EB	EB	EB	EB	EC	EB	EB				
47,000 pF	473	J	K	M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DE	DG		EB	EB	EB	EB	EB	EC	ED	ED				
56,000 pF	563	J	K	M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE	DG		EB	EB	EB	EB	EB	EB	ED	ED				
68,000 pF	683	J	K	M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE			EB	EB	EB	EB	EB	EB	ED	ED				
82,000 pF	823	J	K	M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE			EB	EB	EB	EB	EB	EB	ED	ED				
0.10 uF	104	J	K	M	BB	BB	BB			CB	CB	CB	CB	CB			DC	DC	DC	DC	DC	DE			EB	EB	EB	EB	EB	EB	EM	EM				
0.12 uF	124	J	K	M						CB	CB	CB	CB	CB			DC	DC	DC	DC	DD	DG			EC	EC	EC	EC	EC	EC	EG					
0.15 uF	154	J	K	M						CB	CB	CB	CB	CB			DC	DC	DC	DC	DD	DG			EC	EC	EC	EC	EC	EC	EG					
0.18 uF	184	J	K	M						CB	CB	CB	CB				DC	DC	DC	DC	DD	DG			EC	EC	EC	EC	EC	EC						
0.22 uF	224	J	K	M						CB	CB	CB	CD				DC	DC	DC	DC	DD	DG			EC	EC	EC	EC	EC	EC						
0.27 uF	274	J	K	M						CB	CB	CB					DD	DD	DD	DD	DD				EB	EB	EB	EB	EC	EM						
0.33 uF	334	J	K	M						CB	CB	CB					DD	DD	DD	DD	DD				EB	EB	EB	EB	EC	EG						
0.39 uF	394	J	K	M						CB	CB	CB					DG	DD	DG	DG	DE				EB	EB	EB	EB	EC	EG						
0.47 uF	474	J	K	M						CB	CB	CB					DD	DD	DD	DD	DE				EC	EC	EC	EC	EC	EG						
0.56 uF	564	J	K	M													DD	DD	DD	DG	DH				ED	ED	ED	ED	EC							
0.68 uF	684	J	K	M													DD	DD	DD	DG	DH				EE	EE	EE	EE	ED							
0.82 uF	824	J	K	M													DD	DD	DD	DG					EF	EF	EF	EF	ED							
1.0 uF	105	J	K	M													DD	DD	DD	DG					EF	EF	EF	EG	ED							
1.2 uF	125	J	K	M													DE	DE	DE						ED	ED	ED	EG	EH							
1.5 uF	155	J	K	M													DG	DG	DG						EF	EF	EF	EG	EH							
1.8 uF	185	J	K	M													DG	DG	DG						ED	ED	ED	EF	EH							
2.2 uF	225	J	K	M													DG	DG							ED	ED	ED	EF	EH							
2.7 uF	275	J	K	M																					EN	EN	EN	EH								
3.3 uF	335	J	K	M																					ED	ED	ED	EH								
3.9 uF	395	J	K	M																					EF	EF	EF	EH								
4.7 uF	475	J	K	M																					EF	EF	EF									
5.6 uF	565	J	K	M																					EH	EH	EH									
6.8 uF	685	J	K	M																					EH	EH	EH									
8.2 uF	825	J	K	M																					EH	EH	EH									
10 uF	106	J	K	M																					EH	EH	EH									
12 uF	126	J	K	M																																
Cap	Cap Code	Voltage DC			6.3	10	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250				
		Voltage Code			9	8	4	3	5	9	8	4	3	5	1	2																				

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