

## Overview

KEMET's Automotive Grade Series surface mount capacitors in X5R 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.

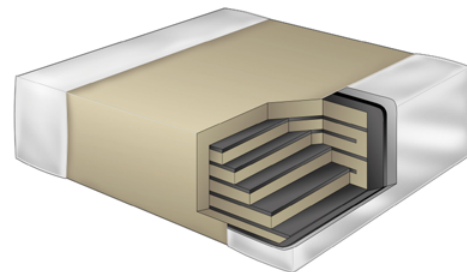
KEMET's X5R dielectric features an 85°C maximum operating temperature and is considered "semi-stable." The Electronics Components, Assemblies & Materials Association (EIA) characterizes X5R dielectric as a Class II material. Components of this classification are fixed, ceramic dielectric capacitors suited for bypass and decoupling applications or for frequency discriminating circuits where Q and stability of capacitance characteristics are not critical. X5R 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 +85°C.

## Benefits

- AEC-Q200 automotive qualified
- -55°C to +85°C operating temperature range
- Pb-Free and RoHS compliant
- Temperature stable dielectric
- EIA 0402, 0603, 0805, 1206, and 1210 case sizes
- DC voltage ratings of 4V, 6.3V, 10V, 16V, 25V, 35V and 50V
- Capacitance offerings ranging from .012 $\mu$ F to 22 $\mu$ F
- Available capacitance tolerances of  $\pm 10\%$  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 and filtering.



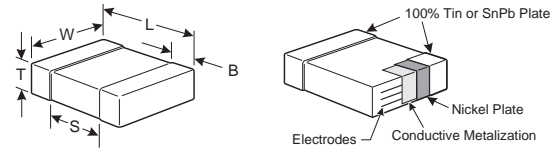
## Ordering Information

C	1206	C	475	K	3	P	A	C	AUTO
Ceramic	Case Size (L" x W")	Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Dielectric	Failure Rate/ Design	Termination Finish <sup>1</sup>	Packaging/Grade (C-Spec) <sup>3</sup>
	0402 0603 0805 1206 1210	C = Standard	2 Sig. Digits + Number of Zeros	K = $\pm 10\%$ M = $\pm 20\%$	7 = 4V 9 = 6.3V 8 = 10V 4 = 16V 3 = 25V	P = X5R	A = N/A	C = 100% Matte Sn	AUTO = Automotive Grade 7" Reel Unmarked

<sup>1</sup> Additional termination finish options may be available. Contact KEMET for details

<sup>2</sup> 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 Min.	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)		

## 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 @[www.aecouncil.com](http://www.aecouncil.com).

## Environmental Compliance

Pb-Free and RoHS compliant

## Electrical Parameters/Characteristics

Item	Parameters/Characteristics
Operating Temperature Range	-55°C to +85°C
Capacitance Change with Reference to +25°C and 0 Vdc Applied (TCC)	±15%
Aging Rate (Max % Cap Loss/Decade Hour)	4.0%
Dielectric Withstanding Voltage	250% of rated voltage (5 ± 1 seconds and charge/discharge not exceeding 50mA)
Dissipation Factor (DF) Maximum Limits @ 25°C	See Dissipation Factor Limit Table
Insulation Resistance (IR) Limit @ 25°C	See Insulation Resistance Limit Table (Rated voltage applied for 120 ± 5 secs @ 25°C)

Regarding Aging Rate: Capacitance measurements (including tolerance) are indexed to a referee time of 1000 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 & 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
X5R	>25	All	3.0	± 20%	10% of Initial Limit
	25		7.5		
	<25	< 0.56 $\mu$ F	7.5		
	<25	≥ 0.56 $\mu$ F	12.0		

## Dissipation Factor Limit Table

Rated Voltage	Capacitance	Dissipation Factor (Limit)
50V - 200V	All	3%
25V	All	5%
<25V	< 0.56 $\mu$ F	5%
<25V	≥ 0.56 $\mu$ F	10%

## Insulation Resistance Limit Table

EIA Case Size	1000 megohm microfarads or 100G $\Omega$	500 megohm microfarads or 10G $\Omega$
0201	N/A	ALL
0402	< .012 $\mu$ F	≥ .012 $\mu$ F
0603	< .047 $\mu$ F	≥ .047 $\mu$ F
0805	< .047 $\mu$ F	≥ .047 $\mu$ F
1206	< 0.22 $\mu$ F	≥ 0.22 $\mu$ F
1210	< 0.39 $\mu$ F	≥ 0.39 $\mu$ F
1808	ALL	N/A
1812	< 2.2 $\mu$ F	≥ 2.2 $\mu$ F
1825	ALL	N/A
2220	< 10 $\mu$ F	≥ 10 $\mu$ F
2225	ALL	N/A

