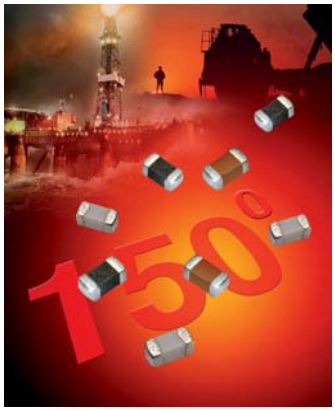
X8R/X8L Dielectric

General Specifications



AVX has developed a range of multilayer ceramic capacitors designed for use in applications up to 150ºC. These capacitors are manufactured with an X8R and an X8L dielectric material. X8R material has capacitance variation of ±15% between - 55ºC and +150ºC. The X8L material has capacitance variation of ±15% between -55ºC to 125ºC and +15/-40% from +125ºC to +150ºC.

The need for X8R and X8L performance has been driven by customer requirements for parts that operate at elevated temperatures. They provide a highly reliable capacitor with low loss and stable capacitance over temperature.

They are ideal for automotive under the hood sensors, and various industrial applications. Typical industrial application would be drilling monitoring system. They can also be used as bulk capacitors for high temperature camera modules.

Both X8R and X8L dielectric capacitors are automotive AEC-Q200 qualified. Optional termination systems, tin, FLEXITERM® and conductive epoxy for hybrid applications are available. Providing this series with our FLEXITERM® termination system provides further advantage to customers by way of enhanced resistance to both, temperature cycling and mechanical damage.

RoHS COMPLIANT

PART NUMBER (see page 2 for complete part number explanation)

0805	5	F	104	K	4	T	2	A
Size 0603, 0805, 1206	**Voltage** 16V = Y, 25V = 3, 50V = 5, 100V = 1	**Dielectric** X8R = F, X8L = L	**Capacitance Code (In pF)** 2 Sig. Digits + Number of Zeros e.g. 10µF = 106	**Capacitance Tolerance** J = ± 5%, K = ±10%, M = ± 20%	**Failure Rate** 4 = Automotive, A = Not Applicable	**Terminations** T = Plated Ni and Sn, Z = FLEXITERM®	**Packaging** 2 = 7" Reel, 4 = 13" Reel	**Special Code** A = Std. Product

NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.

X8R (Flexiterm Offered)

SIZE		0603			0805			1206	
Soldering		Reflow/Wave			Reflow/Wave			Reflow/Wave	
	WVDC	25V	50V		25V	50V		25V	50V
271	Cap 270	G	G						
331	(pF) 330	G	G		J	J			
471	470	G	G		J	J			
681	680	G	G		J	J			
102	1000	G	G	J	J	J	J	J	J
152	1500	G	G	J	J	J	J	J	J
182	1800	G	G	J	J	J	J	J	J
222	2200	G	G	J	J	J	J	J	J
272	2700	G	G	J	J	J	J	J	J
332	3300	G	G	J	J	J	J	J	J
392	3900	G	G	J	J	J	J	J	J
472	4700	G	G	J	J	J	J	J	J
562	5600	G	G	J	J	J	J	J	J
682	6800	G	G	J	J	J	J	J	J
822	8200	G	G	J	J	J	J	J	J
103	Cap 0.01	G	G	J	J	J	J	J	J
123	(µF) 0.012	G	G		J	J	J	J	J
153	0.015	G	G		J	J	J	J	J
223	0.022	G	G		J	J	J	J	J
273	0.027	G	G		J	J		J	J
333	0.033	G	G		J	J		J	J
393	0.039	G	G		J	J		J	J
473	0.047	G	G		J	J		J	J
563	0.056	G			N	N		M	M
683	0.068	G			N	N		M	M
823	0.082				N	N		M	M
104	0.1				N	N		M	M
124	0.12				N	N		M	M
154	0.15				N	N		M	M
184	0.18				N			M	M
224	0.22				N			M	M
274	0.27							M	M
334	0.33							M	M
394	0.39							M	
474	0.47							M	
684	0.68								
105	1								
155	1.5								
225	2.2								
	WVDC	25V	50V	100V	25V	50V	100V	25V	50V
SIZE		0603			0805			1206	

X8L (Flexiterm Offered)

SIZE		0603			0805			1206				1210		
Soldering		Reflow/Wave			Reflow/Wave			Reflow/Wave				Reflow/Wave		
	WVDC	25V	50V	100V	25V	50V	100V	16V	25V	50V	100V	10V	50V	100V
271	Cap 270	G	G											
331	(pF) 330	G	G	G	J	J	J							
471	470	G	G	G	J	J	J							
681	680	G	G	G	J	J	J							
102	1000	G	G	G	J	J	J		J	J				
152	1500	G	G	G	J	J	J		J	J	J			
182	1800	G	G	G	J	J	J		J	J	J			
222	2200	G	G	G	J	J	J		J	J	J			
272	2700	G	G	G	J	J	J		J	J	J			
332	3300	G	G	G	J	J	J		J	J	J			
392	3900	G	G	G	J	J	J		J	J	J			
472	4700	G	G	G	J	J	J		J	J	J			
562	5600	G	G	G	J	J	J		J	J	J			
682	6800	G	G	G	J	J	J		J	J	J			
822	8200	No Flex	G	G	J	J	J		J	J	J			
103	Cap 0.01	G	G	G	J	J	J		J	J	J			
123	(µF) 0.012	G	G		J	J	J		J	J	J			
153	0.015	G	G		J	J	J		J	J	J			
183	0.018	G	G		J	J	J		J	J	J			
223	0.022	G	G		J	J	J		J	J	J			
273	0.027	G	G		J	J	J		J	J	J			
333	0.033	G	G		J	J	N		J	J	J			
393	0.039	G	G		J	J	N		J	J	J			
473	0.047	G	G		J	J	N		J	J	J			
563	0.056	G	G		J	J	N		J	J	J			
683	0.068	G	G		J	J	N		J	J	J			
823	0.082	G	G		J	J	N		J	J	J			
104	0.1	G	G		J	J	N		J	J	M			
124	0.12				J	N			J	J	M			
154	0.15				J	N		J	J	J	Q			
184	0.18				N	N		J	J	J	Q			
224	0.22				N	N		J	J	J	Q			
274	0.27				N			J	M	M	Q			
334	0.33				N			J	M	M	Q			
394	0.39				N			M	M	P	Q			
474	0.47				N			M	M	P	Q			
684	0.68				N			M	M	P	Q			
824	0.82				N			M	M	P	Q			
105	1				N			M	M	P	Q			
155	1.5							M	M					
225	2.2							M	M				Z	Z
475													Z	
106												Z		
	WVDC	25V	50V	100V	25V	50V	100V	16V	25V	50V	100V	10V	50V	100V
SIZE		0603			0805			1206				1210		

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER					EMBOSSED							

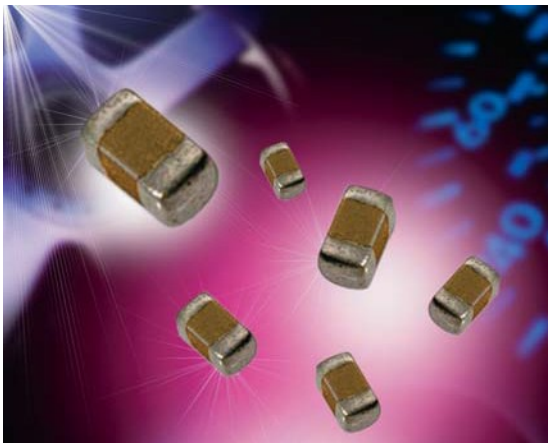
= AEC-Q200 Qualified

X8R/X8L Dielectric

General Specifications

APPLICATIONS FOR X8R AND X8L CAPACITORS

- All market sectors with a 150°C requirement
- Automotive on engine applications
- Oil exploration applications
- Hybrid automotive applications
  - Battery control
  - Inverter / converter circuits
  - Motor control applications
  - Water pump
- Hybrid commercial applications
  - Emergency circuits
  - Sensors
  - Temperature regulation

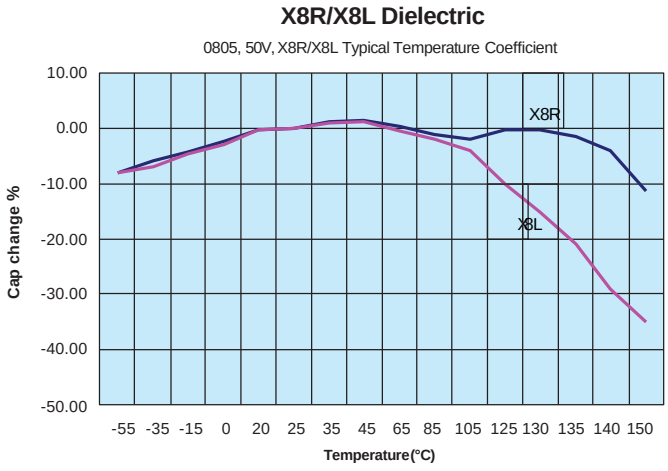


ADVANTAGES OF X8R AND X8L MLC CAPACITORS

- Both ranges are qualified to the highest automotive AEC-Q200 standards
- Excellent reliability compared to other capacitor technologies
- RoHS compliant
- Low ESR / ESL compared to other technologies
- Tin solder finish
- FLEXITERM® available
- Epoxy termination for hybrid available
- 100V range available

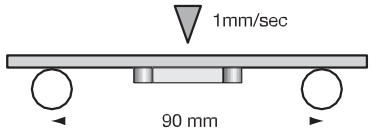
ENGINEERING TOOLS FOR HIGH VOLTAGE MLC CAPACITORS

- Samples
- Technical Articles
- Application Engineering
- Application Support



X8R/X8L Dielectric

Specifications and Test Methods

Parameter/Test		X8R/X8L Specification Limits	Measuring Conditions	
Operating Temperature Range		-55ºC to +150ºC	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz ± 10% Voltage: 1.0Vrms ± .2V	
Dissipation Factor		≤ 2.5% for ≥ 50V DC rating ≤ 3.5% for 25V DC and 16V DC rating		
Insulation Resistance		100,000MΩ or 1000MΩ - µF, whichever is less	Charge device with rated voltage for 120 ± 5 secs @ room temp/humidity	
Dielectric Strength		No breakdown or visual defects	Charge device with 250% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) Note: Charge device with 150% of rated voltage for 500V devices.	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	Capacitance Variation	≤ ±12%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	≥ Initial Value x 0.3		
Solderability		≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 ± 5ºC for 5.0 ± 0.5 seconds	
Resistance to Solder Heat	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260ºC for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.	
	Capacitance Variation	≤ ±7.5%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Thermal Shock	Appearance	No visual defects	Step 1: -55ºC ± 2º	30 ± 3 minutes
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes
	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125ºC ± 2º	30 ± 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	≤ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 ± 2 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with 1.5 rated voltage (≤ 10V) in test chamber set at 150ºC ± 2ºC for 1000 hours (+48, -0) Remove from test chamber and stabilize at room temperature for 24 ± 2 hours before measuring.	
	Capacitance Variation	≤ ±12.5%		
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Load Humidity	Appearance	No visual defects	Store in a test chamber set at 85ºC ± 2ºC/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied. Remove from chamber and stabilize at room temperature and humidity for 24 ± 2 hours before measuring.	
	Capacitance Variation	≤ ±12.5%		
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		