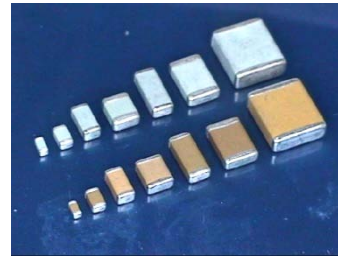


ACC Series

Automotive Grade NP0 & X7R MLCC Capacitors. Rated Voltages 16V – 250V



◆ Features

- AEC-Q200 qualified.
- Suitable for harsh Automotive environments without additional qualification testing.
- Available with SuperTerm (flexible terminations) to prevent mechanical cracking.
- High Reliability
- Sizes 0805 and 1206 with capacitance range from 10pF – 470nF
- Rated voltages up to 250Vdc
- RoHS compliant.

◆ Applications.

- Power supplies
- Lighting
- Isolation
- Powertrain
- Safety equipment
- Custom applications

◆ Summary of Specifications

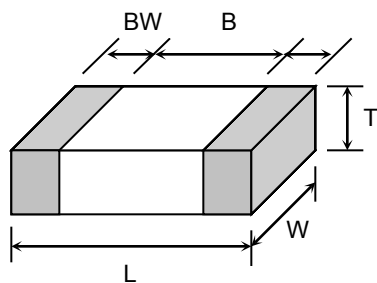
Operating Temperature	-55~+125 °C
Rated Voltage	16Vdc to 250Vdc
Temperature Coefficient	NP0 : $\leq \pm 30\text{ppm}/^\circ\text{C}$, -55~+125 °C (EIA Class I)
	X7R : $\leq \pm 15\%$, -55~+125 °C (EIA Class II)
Capacitance Range	NP0 : 10pF to 4.7nF ; X7R : 330pF to 470nF
Dissipation Factor	NP0 : $Q \geq 1000$; X7R : D.F. $\leq 2.5\%$
Insulation Resistance	10G Ω or 500/C Ω whichever is smaller(C in Farad)
Ageing	NP0: 0% ; X7R: 2.5% per decade of time
Dielectric Strength	$V < 100V$: 250% rated voltage
	$100V \leq V \leq 250V$: 200% rated voltage

◆ How To Order

ACC	0805	X	104	K	050	T	X
Product Code ACC: Automotive Grade Capacitors	Chip Size EX.: 0805 1206	Dielectric Ex.: N: NP0 X: X7R	Capacitance Unit : pF Ex.: 100:10×10 ⁰ 471:47×10 ¹ 102:10×10 ² 473:47×10 ³ 104:10×10 ⁴	Tolerance Ex.: C: +/-0.25pF D: +/-0.50pF J : +/- 5% K : +/-10% M: +/-20%	Rated Voltage Ex.: 050:50Vdc 251:250Vdc	Packaging Ex.: T: Tape & Reel B: Bulk	Special Requirement Ex.: X: Polymer Termination (SuperTerm)

Sinus Electronic GmbH
07132 9969 25
Michael.Feimer@sinus-electronic.de

◆ Dimensions



Unit : mm [inches]

TYPE	L	W	T (max)	B (min)	BW (min)
0805	2.00±0.20 [.079±.008]	1.25±0.20 [.049 ±.008]	1.45 [.057]	0.70 [.028]	0.20 [.008]
1206	3.20 ±0.30 [.126±.012]	1.60±0.20 [.063±.008]	1.80 [.071]	1.50 [.059]	0.30 [.012]

◆ Capacitance Range

Temperature Characteristic	Size	Rated Voltage	Capacitance Range (pF)																																						
			100	120	150	180	200	220	270	300	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	472	562	682	822	103	123
NPO	0805	25V	B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/C/C																																						
		50V	B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/C/C																																						
		100V	B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/C/C																																						
		250V	B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/B/C/C/C																																						
	1206	25V	B/C/C/D																																						
		50V	B/C/C/D																																						
		100V	B/C/C/D																																						
		250V	B/C/C/D																																						

Temperature Characteristic	Size	Rated Voltage	Capacitance Range (pF)																																						
			331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	124	154	184	224	274	334	394	474
X7R	0805	16V	B/B																																						
		25V	B/B																																						
		50V	B/B																																						
		100V	B/B																																						
	1206	25V	B/B																																						
		50V	B/B																																						
		100V	B/C/C/E																																						
		250V	B/C/C/E																																						

Symbol Code	S	O	A	B	C	D	E	F	G	H
Thickness(mm)	0.3±0.03	0.5±0.05	0.6±0.1	0.85±0.1	1.0±0.1	1.25±0.15	1.6±0.2	2.0±0.2	2.4±0.2	2.8±0.2

■ Other dimensions, capacitance values and voltage ratings are available on request. Please contact your local HEC office.

Specifications & Test Conditions

Item	Specification		Test Conditions		
Operating Temperature	<u>Char.</u>	<u>Operating Temp.</u>			
	NP0(N)	-55°C~ +125°C			
	X7R (X)	-55°C~ +125°C			
Visual	No abnormal exterior appearance		Visual Inspection		
Electrical Characterization	Appearance	No mechanical damage shall occur	Visual inspection		
	Capacitance	Within The Specified Tolerance	<u>Char.</u>	<u>Frequency</u>	<u>Voltage</u>
	Q / Tanδ	Class I (NP0): More Than 30pF : Q ≥1000 30pF & below : Q≥400+20C	NP0		
			C≤100pF	1MHz±10%	1.0±0.2Vrms
		Class II (X7R): Maximum 2.5%	C>100pF	1KHz±10%	
	X7R		1KHz±10%	1.0±0.2Vrms	
			Perform a heat temperature at 150±5°C for 30min. then place at room temp. for 24±2hours.		
Insulation Resistance	10,000MΩ or 500/C Ω whichever is smaller. (C in Farad)	V ≤ 500V, Rated Voltage V > 500V, Applied 500Vdc Charge Time : 120sec. Is applied less than 50mA current.			
Withstanding Voltage	No dielectric breakdown or mechanical breakdown	V < 100V : 250% Rated Voltage 100≤V ≤250 : 200% Rated Voltage for 1~5 sec. Current is limited to less than 50mA.			
Temperature Capacitance Coefficient	<u>Char.</u>	<u>Temp. Range</u>	<u>Cap. Change</u>	ClassI:	
	NP0(N)	-55°C~+125°C	± 30ppm/°C	[C2-C1/C1(T2-T1)] × 100%	
	X7R (X)	-55°C~+125°C	± 15%	Class II : (C2-C1)/C1 × 100%	
			T1:Standard temperature(25°C) T2:Test temperature C1:Capacitance at standard temperature C2:Capacitance at test temperature		
High Temperature Exposure (Storage)	Appearance	No mechanical damage shall occur	Test Temperature : 150± 3°C Test Time :1000+12/-0 hours		
	Capacitance	Class I (NP0) : Within ±2.5% or ±0.25pF whichever is larger of initial value Class II (X7R) : Within ± 10% of initial value	Measure at room temperature after cooling for 24 ± 2 hours.		
	Q / Tanδ	Class I (NP0): To satisfy the specified initial value Class II (X7R): Maximum 5.0%			
	Insulation Resistance	To satisfy the specified initial value			

Specifications & Test Conditions

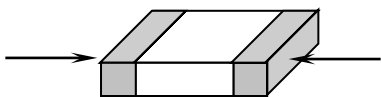
Item	Specification	Test Conditions															
Temperature Cycle	Appearance	No mechanical damage shall occur															
	Capacitance	Class I (NP0): Within 2.5% or $\pm 0.25\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 10\%$ of initial value															
	Q / Tan δ	Class I (NP0): To satisfy the specified initial value Class II (X7R): Maximum 5.0%															
	Insulation Resistance	To satisfy the specified initial value															
		Class II capacitor shall be set for 24 ± 2 hours at room temperature after one hour heat treatment at $150 +0/-10$ °C before initial measure. Capacitor shall be subjected to 1000 cycles of the temperature cycle as following: <table border="1" data-bbox="856 518 1356 673"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min Rated Temp.+0/-3</td> <td>15\pm3</td> </tr> <tr> <td>2</td> <td>25</td> <td>1</td> </tr> <tr> <td>3</td> <td>Max Rated Temp.+3/-0</td> <td>15\pm3</td> </tr> <tr> <td>4</td> <td>25</td> <td>1</td> </tr> </tbody> </table> Measure at room temperature after cooling for 24 ± 2 hours.	Step	Temp.(°C)	Time(min)	1	Min Rated Temp.+0/-3	15 \pm 3	2	25	1	3	Max Rated Temp.+3/-0	15 \pm 3	4	25	1
Step	Temp.(°C)	Time(min)															
1	Min Rated Temp.+0/-3	15 \pm 3															
2	25	1															
3	Max Rated Temp.+3/-0	15 \pm 3															
4	25	1															
Destructive Physical Analysis	No defects or abnormalities	Per EIA-469															
Moisture Resistance	Appearance	No mechanical damage shall occur															
	Capacitance	Class I (NP0): Within $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 12.5\%$ of initial value															
	Q / Tan δ	Class I (NP0): 30pF & Over : $Q \geq 350$ 10 to 30pF : $Q \geq 275 + 2.5C$ 30pF & below : $Q \geq 200 + 10C$ Class II (X7R): Maximum 5.0%															
	Insulation Resistance	To satisfy the specified initial value															
		Class II capacitor shall be set for 24 ± 2 hours at room temperature after one hour heat treatment at $150 +0/-10$ °C before initial measure. Test Temperature : 25 to 65°C Relative Humidity : 80 to 98%RH Test Time : 10 cycles, t = 24 hours/cycle. Measure at room temperature after cooling for 24 ± 2 hours.															
Biased Humidity	Appearance	No mechanical damage shall occur															
	Capacitance	Class I (NP0): Within $\pm 3.0\%$ or $\pm 0.30\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 12.5\%$ of initial value															
	Q / Tan δ	Class I (NP0): More Than 30pF : $Q \geq 200$ 30pF & below : $Q \geq 100 + 10/3C$ Class II (X7R): Maximum 5.0%															
	Insulation Resistance	500M Ω or 25/C Ω whichever is smaller. (C in Farad)															
		Class II capacitors applied DC voltage of the rated voltage is applied for one hour at maximum operation temperature $\pm 3^\circ\text{C}$ then shall be set for 24 ± 2 hours at room temperature and the initial measurement shall be conducted. Applied Voltage : Rated voltage(500Vdc max.) and 1.3 to 1.5Vdc.(add 100Kohm resistor) Temperature : $85 \pm 3^\circ\text{C}$ Relative Humidity : 80 to 85%RH Test Time : $1000 + 12/-0$ hours Current Applied : 50 mA Max. Measure at room temperature after cooling for 24 ± 2 hours.															

Specifications & Test Conditions

Item	Specification	Test Conditions						
Operational Life	Appearance	No mechanical damage shall occur						
	Capacitance	Class I (NP0): Within $\pm 3.0\%$ or $\pm 0.30\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 12.5\%$ of initial value						
	Q / Tan δ	Class I (NP0): 30pF & Over : $Q \geq 350$ 10 to 30pF : $Q \geq 275 + 2.5C$ 30pF & below: $Q \geq 200 + 10C$ Class II (X7R): Maximum 5.0%						
	Insulation Resistance	1,000M Ω or 50/C Ω whichever is smaller. (C in Farad)						
		Class II capacitors applied DC voltage (following table) is applied for one hour at $150 \pm 3^\circ\text{C}$ then shall be set for 24 ± 2 hours at room temperature and the initial measurement shall be conducted.						
		Applied Voltage :						
		<table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Applied Voltage</th> </tr> </thead> <tbody> <tr> <td>$V < 100\text{Vdc}$</td> <td>200%Rated Voltage</td> </tr> <tr> <td>$100\text{Vdc} \leq V \leq 250\text{Vdc}$</td> <td>150%Rated Voltage</td> </tr> </tbody> </table>	Rated Voltage	Applied Voltage	$V < 100\text{Vdc}$	200%Rated Voltage	$100\text{Vdc} \leq V \leq 250\text{Vdc}$	150%Rated Voltage
Rated Voltage	Applied Voltage							
$V < 100\text{Vdc}$	200%Rated Voltage							
$100\text{Vdc} \leq V \leq 250\text{Vdc}$	150%Rated Voltage							
		Test Temperature : $125 \pm 3^\circ\text{C}$ Test Time : 1000 +12/-0 hours Current Applied : 50 mA Max.						
		Measure at room temperature after cooling for 24 ± 2 hours.						
External Visual	No defects or abnormalities	Visual inspection						
Physical Dimension	Within The Specified dimensions	Using calipers						
Mechanical Shock	Appearance	No mechanical damage shall occur						
	Capacitance	Within the specified tolerance						
	Q / Tan δ	To satisfy the specified initial value						
	Insulation Resistance	To satisfy the specified initial value						
		Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks).						
		The specified test pulse should be Half-sine and should have a duration: 0.5ms, peak value: 1500g.						
Vibration	Appearance	No mechanical damage shall occur						
	Capacitance	Within the specified tolerance						
	Q / Tan δ	To satisfy the specified initial value						
	Insulation Resistance	To satisfy the specified initial value						
		Solder the capacitor on P.C. board.						
		Vibrate the capacitor with an amplitude of 1.5mm P-P changing the frequencies from 10Hz to 2000Hz and return to 10Hz in about 20 min.						
		This motion should be applied for 12 cycles in each 3 mutually perpendicular directions (total of 36 cycles).						

Specifications & Test Conditions

Item	Specification	Test Conditions
Resistance to Soldering Heat	Appearance	No mechanical damage shall occur
	Capacitance	Class I (NP0): Within 2.5% or $\pm 0.25\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 10\%$ of initial value
	Q / Tan δ	To satisfy the specified initial value
	Insulation Resistance	To satisfy the specified initial value
Thermal Shock	Appearance	No mechanical damage shall occur
	Capacitance	Class I (NP0): Within 2.5% or $\pm 0.25\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 10\%$ of initial value
	Q / Tan δ	To satisfy the specified initial value
	Insulation Resistance	To satisfy the specified initial value
ESD	Appearance	No mechanical damage shall occur
	Capacitance	Within the Specified Tolerance
	Q / Tan δ	To satisfy the specified initial value
	Insulation Resistance	To satisfy the specified initial value
Solderability	More than 95% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve .	(a)Preheat at 155°C for 4 hours,immerse the capacitor in flux. Immerse in solder bath for 5+0/-0.5 sec. at 235 \pm 5°C.
		(b)Should be placed into steam aging for 8 hours \pm 15 minutes.After preheating, immerse the capacitor in flux. Immerse in solder bath for5+0/-0.5 sec. at 235 \pm 5°C.
		(c) Should be placed into steam aging for 8 hours \pm 15 minutes.After preheating, immerse the capacitor in flux. Immerse in solder bath for120 \pm 5 sec. at 260 \pm 5°C.



Specifications & Test Conditions

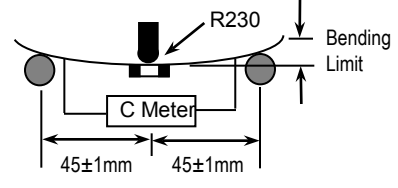
Item	Specification	Test Conditions
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Board Flex

No mechanical damage or capacitance change more than the following table.

Char.	Capacitance Change
NP0(N)	$\leq \pm 5.0\%$ of initial value
X7R (X)	$\leq \pm 12.5\%$ of initial value

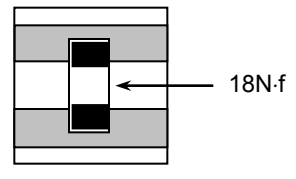
Bending shall be applied to the 2.0 mm for X7R, and 3mm for NP0 with rate of 1.0mm/sec. The duration of the applied forces shall be 60sec.



Terminal Strength

Appearance	No mechanical damage shall occur
Capacitance	Within The Specified Tolerance
Q / Tanδ	To satisfy the specified initial value
Insulation Resistance	To satisfy the specified initial value

A 18N-f (≈ 1.8Kg-f) pull force shall be applied for 60±1 sec.

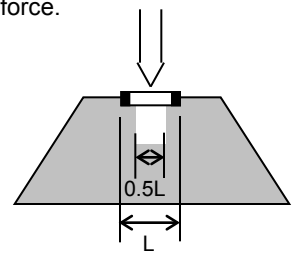


Beam Load Test

The chip endure following force.

Chip Length	Chip Thickness	Force min.
$\leq 2.5\text{mm}$	$\leq 0.5\text{mm}$	8N
$\geq 2.0\text{mm}$	$> 0.5\text{mm}$	15N
$\geq 3.2\text{mm}$	$< 1.25\text{mm}$	
$\geq 5.4.5\text{mm}$	$\geq 1.25\text{mm}$	

Place the capacitor in the beam load fixture. Apply a force.



Speed supplied the stress Load: 2.5mm/sec