

Medium Voltage for Automotive Soft Termination Type GCJ Series Specifications and Test Methods

No.	AEC-Q200 Test Item	Specifications	AEC-Q200 Test Method															
1	Pre- and Post-Stress Electrical Test	-																
2	High Temperature Exposure (Storage)	The measured and observed characteristics should satisfy the specifications in the following table.	Set the capacitor for 1000±12 hours at 150±3°C. Let sit for 24±2 hours at room temperature, then measure.															
	Appearance	No marking defects																
	Capacitance Change	Within ±10%																
	D.F.	0.05 max.																
	I.R.	More than 10,000MΩ or 100MΩ · μF (Whichever is smaller)																
3	Temperature Cycle	The measured and observed characteristics should satisfy the specifications in the following table.	Fix the capacitor to the supporting jig in the same manner and under the same conditions as (19). Perform the 1000 cycles according to the 4 heat treatments listed in the following table. Let sit for 24±2 hours at room temperature, then measure. <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th>Step</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>Temp. (°C)</td> <td>-55+0/-3</td> <td>Room Temp.</td> <td>125+3/-0</td> <td>Room Temp.</td> </tr> <tr> <td>Time (min.)</td> <td>15±3</td> <td>1</td> <td>15±3</td> <td>1</td> </tr> </tbody> </table> •Pretreatment Perform the heat treatment at 150+0/-10°C for 60±5 minutes and then let sit for 24±2 hours at room temperature.	Step	1	2	3	4	Temp. (°C)	-55+0/-3	Room Temp.	125+3/-0	Room Temp.	Time (min.)	15±3	1	15±3	1
	Step	1		2	3	4												
	Temp. (°C)	-55+0/-3		Room Temp.	125+3/-0	Room Temp.												
	Time (min.)	15±3		1	15±3	1												
Appearance	No marking defects																	
Capacitance Change	Within ±10%																	
	D.F.	0.025 max.																
	I.R.	More than 10,000MΩ or 100MΩ · μF (Whichever is smaller)																
4	Destructive Physical Analysis	No defects or abnormalities	Per EIA-469															
5	Moisture Resistance	The measured and observed characteristics should satisfy the specifications in the following table.	Apply the 24-hour heat (25 to 65°C) and humidity (80 to 98%) treatment shown below, 10 consecutive times. Let sit for 24±2 hours at room temperature, then measure. <div style="text-align: center; margin-top: 10px;"> </div>															
	Appearance	No marking defects																
	Capacitance Change	Within ±12.5%																
	D.F.	0.05 max.																
	I.R.	More than 10,000MΩ or 100MΩ · μF (Whichever is smaller)																
6	Biased Humidity	The measured and observed characteristics should satisfy the specifications in the following table.	Apply the rated voltage and DC1.3+0.2/-0V (add 6.8kΩ resistor) at 85±3°C and 80 to 85% humidity for 1000±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. <ul style="list-style-type: none"> •Pretreatment Perform the heat treatment at 150+0/-10°C for 60±5 minutes and then let sit for 24±2 hours at room temperature. 															
	Appearance	No marking defects																
	Capacitance Change	Within ±12.5%																
	D.F.	0.05 max.																
	I.R.	More than 1,000MΩ or 10MΩ · μF (Whichever is smaller)																
7	Operational Life	The measured and observed characteristics should satisfy the specifications in the following table.	Apply voltage as in the Table for 1000±12 hours at 125±3°C. Let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA. <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th>Rated Voltage</th> <th>Applied Voltage</th> </tr> </thead> <tbody> <tr> <td>DC250V</td> <td>150% of the rated voltage</td> </tr> <tr> <td>DC630V</td> <td>120% of the rated voltage</td> </tr> </tbody> </table> <ul style="list-style-type: none"> •Pretreatment Apply test voltage for 60±5 minutes at test temperature. Remove and let sit for 24±2 hours at room temperature. 	Rated Voltage	Applied Voltage	DC250V	150% of the rated voltage	DC630V	120% of the rated voltage									
	Rated Voltage	Applied Voltage																
	DC250V	150% of the rated voltage																
	DC630V	120% of the rated voltage																
Appearance	No marking defects																	
Capacitance Change	Within ±12.5%																	
D.F.	0.05 max.																	
	I.R.	More than 1,000MΩ or 10MΩ · μF (Whichever is smaller)																
8	External Visual	No defects or abnormalities	Visual inspection															
9	Physical Dimension	Within the specified dimensions	Using calipers and micrometers															

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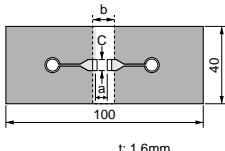
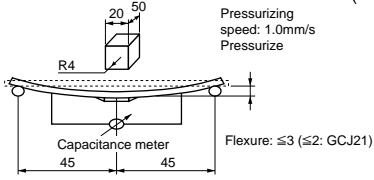
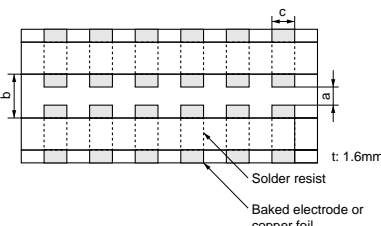
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No.	AEC-Q200 Test Item	Specifications	AEC-Q200 Test Method									
10	Resistance to Solvents	Appearance	No marking defects									
		Capacitance Change	Within the specified tolerance									
		D.F.	0.025 max.									
		I.R.	More than 10,000MΩ or 100MΩ · μF (Whichever is smaller)									
			Per MIL-STD-202 Method 215 Solvent 1: 1 part (by volume) of isopropyl alcohol 3 parts (by volume) of mineral spirits Solvent 2: Terpene defluxer Solvent 3: 42 parts (by volume) of water 1 part (by volume) of propylene glycol monomethyl ether 1 part (by volume) of monoethanolamine									
11	Mechanical Shock	Appearance	No marking defects									
		Capacitance Change	Within the specified tolerance									
		D.F.	0.025 max.									
			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 and velocity change: 4.7m/s.									
12	Vibration	Appearance	No defects or abnormalities									
		Capacitance Change	Within the specified tolerance									
		D.F.	0.025 max.									
			Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (19). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 2000Hz. The frequency range, from 10 to 2000Hz and return to 10Hz, should be traversed in approximately 20 minutes. This motion should be applied for 12 items in each 3 mutually perpendicular directions (total of 36 times).									
13	Resistance to Soldering Heat	The measured and observed characteristics should satisfy the specifications in the following table.										
		Appearance	No marking defects									
		Capacitance Change	Within ±10%									
		D.F.	0.025 max.									
			Immerse the capacitor in a eutectic solder solution at 260±5°C for 10±1 seconds. Let sit at room temperature for 24±2 hours, then measure. •Pretreatment Perform the heat treatment at 150+0/-10°C for 60±5 minutes and then let sit for 24±2 hours at room temperature.									
14	Thermal Shock	The measured and observed characteristics should satisfy the specifications in the following table.										
		Appearance	No marking defects									
		Capacitance Change	Within ±10%									
		D.F.	0.025 max.									
			Fix the capacitor to the supporting jig in the same manner and under the same conditions as (19). Perform the 300 cycles according to the two heat treatments listed in the following table (maximum transfer time is 20 seconds). Let sit for 24±2 hours at room temperature, then measure.									
			<table border="1"> <thead> <tr> <th>Step</th> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td>Temp. (°C)</td> <td>-55+0/-3</td> <td>125+3/-0</td> </tr> <tr> <td>Time (min.)</td> <td>15±3</td> <td>15±3</td> </tr> </tbody> </table>	Step	1	2	Temp. (°C)	-55+0/-3	125+3/-0	Time (min.)	15±3	15±3
Step	1	2										
Temp. (°C)	-55+0/-3	125+3/-0										
Time (min.)	15±3	15±3										
			•Pretreatment Perform the heat treatment at 150+0/-10°C for 60±5 minutes and then let sit for 24±2 hours at room temperature.									
15	ESD	Appearance	No marking defects									
		Capacitance Change	Within the specified tolerance									
		D.F.	0.025 max.									
		I.R.	More than 10,000MΩ or 100MΩ · μF (Whichever is smaller)									
			Per AEC-Q200-002									
16	Solderability	95% of the terminations are to be soldered evenly and continuously.										
		(a) Preheat at 155°C for 4 hours. After preheating, immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 5+0/-0.5 seconds at 235±5°C.										
		(b) Should be placed into steam aging for 8 hours±15 minutes. After preheating, immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 5+0/-0.5 seconds at 235±5°C.										
			(c) Should be placed into steam aging for 8 hours±15 minutes. After preheating, immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Immerse in eutectic solder solution for 120 ±5 seconds at 260±5°C.									

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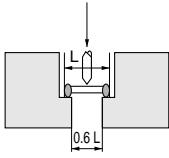
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No.	AEC-Q200 Test Item	Specifications	AEC-Q200 Test Method																								
17	Electrical Characterization	Appearance	No defects or abnormalities																								
		Capacitance Change	Within the specified tolerance																								
		D.F.	0.025 max.																								
		I.R.	25°C More than 10,000MΩ or 100MΩ · μF (Whichever is smaller) Max. Operating Temperature...125°C More than 1,000MΩ or 10MΩ · μF (Whichever is smaller)																								
		Dielectric Strength	No failure																								
			<p>Visual inspection.</p> <p>The capacitance/Q should be measured at 25°C at the frequency and voltage shown in the table.</p> <table border="1"> <thead> <tr> <th>Capacitance</th> <th>Frequency</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>C < 1000pF</td> <td>1±0.2MHz</td> <td>AC0.5 to 5V(r.m.s.)</td> </tr> <tr> <td>C ≥ 1000pF</td> <td>1±0.2kHz</td> <td>AC1±0.2V(r.m.s.)</td> </tr> </tbody> </table> <p>The insulation resistance should be measured with DC500±50V (DC250±25V in case of rated voltage: DC250V) at 25°C and 125°C and within 2 minutes of charging.</p> <p>No failure should be observed when voltage as in the Table is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Test Voltage</th> </tr> </thead> <tbody> <tr> <td>DC250V</td> <td>200% of the rated voltage</td> </tr> <tr> <td>DC630V</td> <td>150% of the rated voltage</td> </tr> </tbody> </table>	Capacitance	Frequency	Voltage	C < 1000pF	1±0.2MHz	AC0.5 to 5V(r.m.s.)	C ≥ 1000pF	1±0.2kHz	AC1±0.2V(r.m.s.)	Rated Voltage	Test Voltage	DC250V	200% of the rated voltage	DC630V	150% of the rated voltage									
Capacitance	Frequency	Voltage																									
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Rated Voltage	Test Voltage																										
DC250V	200% of the rated voltage																										
DC630V	150% of the rated voltage																										
18	Board Flex	Appearance	No marking defects																								
		Capacitance Change	Within ±12.5%																								
			<p>Solder the capacitor on the test jig (glass epoxy board) as shown in Fig. 1 using a eutectic solder. Then apply a force in the direction shown in Fig. 2 for 5±1 seconds. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p> <table border="1"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>GCJ21</td> <td>0.8</td> <td>3.0</td> <td>1.3</td> </tr> <tr> <td>GCJ31</td> <td>2.0</td> <td>4.4</td> <td>1.7</td> </tr> <tr> <td>GCJ32</td> <td>2.0</td> <td>4.4</td> <td>2.6</td> </tr> <tr> <td>GCJ43</td> <td>3.0</td> <td>6.0</td> <td>3.3</td> </tr> <tr> <td>GCJ55</td> <td>4.2</td> <td>7.2</td> <td>5.1</td> </tr> </tbody> </table> <p>(in mm)</p>  <p>Fig. 1</p>  <p>Fig. 2</p>	Type	a	b	c	GCJ21	0.8	3.0	1.3	GCJ31	2.0	4.4	1.7	GCJ32	2.0	4.4	2.6	GCJ43	3.0	6.0	3.3	GCJ55	4.2	7.2	5.1
Type	a	b	c																								
GCJ21	0.8	3.0	1.3																								
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GCJ43	3.0	6.0	3.3																								
GCJ55	4.2	7.2	5.1																								
19	Terminal Strength	Appearance	No marking defects																								
		Capacitance Change	Within the specified tolerance																								
		D.F.	0.025 max.																								
		I.R.	More than 10,000MΩ or 100MΩ · μF (Whichever is smaller)																								
			<p>Solder the capacitor to the test jig (glass epoxy board) as shown in Fig. 3 using a eutectic solder. Then apply 18N force in parallel with the test jig for 60 seconds. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p> <table border="1"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>GCJ21</td> <td>1.2</td> <td>4.0</td> <td>1.65</td> </tr> <tr> <td>GCJ31</td> <td>2.2</td> <td>5.0</td> <td>2.0</td> </tr> <tr> <td>GCJ32</td> <td>2.2</td> <td>5.0</td> <td>2.9</td> </tr> <tr> <td>GCJ43</td> <td>3.5</td> <td>7.0</td> <td>3.7</td> </tr> <tr> <td>GCJ55</td> <td>4.5</td> <td>8.0</td> <td>5.6</td> </tr> </tbody> </table> <p>(in mm)</p>  <p>Fig. 3</p>	Type	a	b	c	GCJ21	1.2	4.0	1.65	GCJ31	2.2	5.0	2.0	GCJ32	2.2	5.0	2.9	GCJ43	3.5	7.0	3.7	GCJ55	4.5	8.0	5.6
Type	a	b	c																								
GCJ21	1.2	4.0	1.65																								
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No.	AEC-Q200 Test Item	Specifications	AEC-Q200 Test Method												
20	Beam Load Test	The chip should endure the following force. Chip thickness < 1.25mm rank: 15N Chip thickness ≥ 1.25mm rank: 54.5N	Place the capacitor in the beam load fixture as in Fig. 4. Apply force. <div style="text-align: center;">  <p>Fig. 4</p> </div> Speed at which to supply the Stress Load: 2.5mm / s												
21	Capacitance Temperature Characteristics Capacitance Change	Within ±15%	The capacitance change should be measured after 5 minutes at each specified temperature stage. <table border="1" data-bbox="938 645 1453 797"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25±2</td> </tr> <tr> <td>2</td> <td>-55±3</td> </tr> <tr> <td>3</td> <td>25±2</td> </tr> <tr> <td>4</td> <td>125±3</td> </tr> <tr> <td>5</td> <td>25±2</td> </tr> </tbody> </table> The ranges of capacitance change compared with the above 25°C value over the temperature ranges shown in the table should be within the specified ranges. <ul style="list-style-type: none"> •Pretreatment Perform the heat treatment at 150+0/-10°C for 60±5 minutes and then let sit for 24±2 hours at room temperature. Perform the initial measurement.	Step	Temperature (°C)	1	25±2	2	-55±3	3	25±2	4	125±3	5	25±2
Step	Temperature (°C)														
1	25±2														
2	-55±3														
3	25±2														
4	125±3														
5	25±2														