

# ALUMINUM ELECTROLYTIC CAPACITORS SPECIFICATION SHEET

Halogen Free

CUSTOMER PART No.		
Rubycon PART No.	YXG SERIES (Option Code : LLC)	
DRAWING No.	REE - 036382	ISSUE No. 2
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**RUBYCON CORPORATION**  
ENGINEERING DIVISION  
ELECTROLYTIC CAPACITOR DESIGN DEPT

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## 1. Scope.

This specification covers polarized aluminum electrolytic capacitors with non-solid electrolyte for use in electronic equipments.

## 2. Reference Standard

JIS C 5141 (1991) and JIS C 5102 (1994) methods for testing.

## 3. Operating Temperature Range

-40°C to +105°C

## 4. Performance

Refer to Table-2

## 5. Style and Numbering System

(1) Style CE 04 (Radial Leaded)

(2) Numbering System	Rated Voltage	Series	Nominal Capacitance	Tolerance	Option	Lead Forming	Case size
	□□□	YXG	□□□	M	LLC	□□	□□□ X □□□

## 6. Marking

Unless otherwise specified, capacitor shall be clearly marked the following items on its body.

Sleeve color: Black

Lettering color: White

(1) Trade mark

**Rubycon**

(2) Rated Voltage

V

(3) Nominal Capacitance

μF

(4) Polarity

 (Negative Polarity)

(5) Series

YXG

(6) Lot Number

(7) Maximum Operating Temperature

105°C

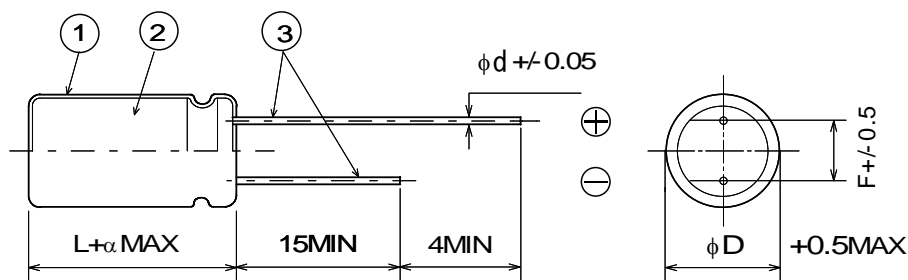
(8) PET Sleeve mark

PET

## 7. Vent

On capacitors whose diameter is 6.3mm and greater, a safety vent shall be provided.

## 8. Diagram of dimensions. :unit mm



φD	5	6.3	8	10	12.5	16	18
φd	0.5		0.6			0.8	
F	2.0	2.5	3.5	5.0		7.5	
α	L≤16 : α=1.5			L≥20 : α=2.0			

①	Sleeve	P.E.T.
②	Case	Aluminum
③	Lead Wire	Tin plated

## 9. Standard size

◆Table-1 Standard size, Rated ripple current, Impedance

capacitance (μF)	Size φDxL(mm)	Rated voltage 6.3V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance (ΩMAX)	
			20°C,100kHz	-10°C,100kHz
150	5X11	210	0.58	2.3
330	6.3X11	340	0.22	0.87
680	8X11.5	640	0.13	0.52
820	10X12.5	865	0.080	0.32
1000	8X16	840	0.087	0.35
1200	8X20	1050	0.069	0.27
1200	10X16	1210	0.060	0.24
1500	10X20	1400	0.046	0.18
1800	12.5X16	1450	0.049	0.16
2200	10X23	1650	0.042	0.17
2700	10X28	1910	0.031	0.12
2700	16X16	1940	0.042	0.12
3300	12.5X20	1900	0.035	0.12
3900	12.5X25	2230	0.027	0.089
3900	18X16	2210	0.043	0.11
4700	12.5X30	2650	0.024	0.078
5600	12.5X35	2880	0.020	0.065
5600	16X20	2530	0.027	0.078
6800	12.5X40	3350	0.017	0.056
6800	16X25	2930	0.021	0.060
6800	18X20	2860	0.026	0.067
8200	16X31.5	3450	0.017	0.050
10000	16X35.5	3610	0.015	0.044
10000	18X25	3140	0.019	0.049
12000	16X40	4080	0.013	0.038
12000	18X31.5	4170	0.015	0.040
15000	18X35.5	4220	0.014	0.038
18000	18X40	4280	0.012	0.032

**Rubycon****YXG SERIES**

capacitance ( $\mu$ F)	Size $\phi$ DxL(mm)	Rated voltage 10V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance ( $\Omega$ MAX)	
			20°C,100kHz	-10°C,100kHz
100	5X11	210	0.58	2.3
220	6.3X11	340	0.22	0.87
470	8X11.5	640	0.13	0.52
680	8X16	840	0.087	0.35
680	10X12.5	865	0.080	0.32
1000	8X20	1050	0.069	0.27
1000	10X16	1210	0.060	0.24
1200	10X20	1400	0.046	0.18
1500	10X23	1650	0.042	0.17
1500	12.5X16	1450	0.049	0.16
2200	10X28	1910	0.031	0.12
2200	12.5X20	1900	0.035	0.12
2200	16X16	1940	0.042	0.12
2700	18X16	2210	0.043	0.11
3300	12.5X25	2230	0.027	0.089
3900	12.5X30	2650	0.024	0.078
3900	16X20	2530	0.027	0.078
4700	12.5X35	2880	0.020	0.065
5600	12.5X40	3350	0.017	0.056
5600	16X25	2930	0.021	0.060
5600	18X20	2860	0.026	0.067
6800	16X31.5	3450	0.017	0.050
6800	18X25	3140	0.019	0.049
8200	16X35.5	3610	0.015	0.044
8200	18X31.5	4170	0.015	0.040
10000	16X40	4080	0.013	0.038
10000	18X35.5	4220	0.014	0.038
12000	18X40	4280	0.012	0.032

capacitance ( $\mu$ F)	Size $\phi$ DxL(mm)	Rated voltage 16V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance ( $\Omega$ MAX)	
			20°C,100kHz	-10°C,100kHz
56	5X11	210	0.58	2.3
120	6.3X11	340	0.22	0.87
330	8X11.5	640	0.13	0.52
470	8X16	840	0.087	0.35
470	10X12.5	865	0.080	0.32
680	8X20	1050	0.069	0.27
680	10X16	1210	0.060	0.24
1000	10X20	1400	0.046	0.18
1000	12.5X16	1450	0.049	0.16
1200	10X23	1650	0.042	0.17
1500	10X28	1910	0.031	0.12
1500	12.5X20	1900	0.035	0.12
1500	16X16	1940	0.042	0.12
2200	12.5X25	2230	0.027	0.089
2200	18X16	2210	0.043	0.11
2700	12.5X30	2650	0.024	0.078
2700	16X20	2530	0.027	0.078
3300	12.5X35	2880	0.020	0.065
3900	12.5X40	3350	0.017	0.056
3900	16X25	2930	0.021	0.060
3900	18X20	2860	0.026	0.067
4700	16X31.5	3450	0.017	0.050
4700	18X25	3140	0.019	0.049
5600	16X35.5	3610	0.015	0.044
5600	18X31.5	4170	0.015	0.040
6800	16X40	4080	0.013	0.038
8200	18X35.5	4220	0.014	0.038
10000	18X40	4280	0.012	0.032

capacitance ( $\mu$ F)	Size $\phi$ DxL(mm)	Rated voltage 25V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance ( $\Omega$ MAX)	
			20°C,100kHz	-10°C,100kHz
47	5X11	210	0.58	2.3
100	6.3X11	340	0.22	0.87
220	8X11.5	640	0.13	0.52
330	8X16	840	0.087	0.35
330	10X12.5	865	0.080	0.32
470	8X20	1050	0.069	0.27
470	10X16	1210	0.060	0.24
680	10X20	1400	0.046	0.18
680	12.5X16	1450	0.049	0.16
820	10X23	1650	0.042	0.17
1000	10X28	1910	0.031	0.12
1000	12.5X20	1900	0.035	0.12
1000	16X16	1940	0.042	0.12
1200	18X16	2210	0.043	0.11
1500	12.5X25	2230	0.027	0.089
1800	12.5X30	2650	0.024	0.078
1800	16X20	2530	0.027	0.078
2200	12.5X35	2880	0.020	0.065
2200	18X20	2860	0.026	0.067
2700	12.5X40	3350	0.017	0.056
2700	16X25	2930	0.021	0.060
3300	16X31.5	3450	0.017	0.050
3300	18X25	3140	0.019	0.049
3900	16X35.5	3610	0.015	0.044
3900	18X31.5	4170	0.015	0.040
4700	16X40	4080	0.013	0.038
4700	18X35.5	4220	0.014	0.038
5600	18X40	4280	0.012	0.032

capacitance ( $\mu$ F)	Size $\phi$ DxL(mm)	Rated voltage 35V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance ( $\Omega$ MAX)	
			20°C,100kHz	-10°C,100kHz
33	5X11	210	0.58	2.3
56	6.3X11	340	0.22	0.87
150	8X11.5	640	0.13	0.52
220	8X16	840	0.087	0.35
220	10X12.5	865	0.080	0.32
270	8X20	1050	0.069	0.27
330	10X16	1210	0.060	0.24
470	10X20	1400	0.046	0.18
470	12.5X16	1450	0.049	0.16
560	10X23	1650	0.042	0.17
680	10X28	1910	0.031	0.12
680	12.5X20	1900	0.035	0.12
680	16X16	1940	0.042	0.12
1000	12.5X25	2230	0.027	0.089
1000	18X16	2210	0.043	0.11
1200	12.5X30	2650	0.024	0.078
1200	16X20	2530	0.027	0.078
1500	12.5X35	2880	0.020	0.065
1800	12.5X40	3350	0.017	0.056
1800	16X25	2930	0.021	0.060
1800	18X20	2860	0.026	0.067
2200	16X31.5	3450	0.017	0.050
2200	18X25	3140	0.019	0.049
2700	16X35.5	3610	0.015	0.044
2700	18X31.5	4170	0.015	0.040
3300	16X40	4080	0.013	0.038
3300	18X35.5	4220	0.014	0.038
3900	18X40	4280	0.012	0.032

capacitance ( $\mu$ F)	Size $\phi$ DxL(mm)	Rated voltage 50V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance ( $\Omega$ MAX)	
			20°C,100kHz	-10°C,100kHz
22	5X11	180	0.70	2.8
56	6.3X11	295	0.30	1.2
100	8X11.5	555	0.17	0.68
120	8X16	730	0.12	0.48
150	10X12.5	760	0.12	0.48
180	8X20	910	0.091	0.36
220	10X16	1050	0.084	0.34
270	10X20	1220	0.060	0.24
270	12.5X16	1260	0.061	0.20
330	10X23	1440	0.055	0.22
470	10X28	1690	0.043	0.17
470	12.5X20	1660	0.045	0.15
470	16X16	1690	0.055	0.17
560	12.5X25	1950	0.034	0.11
560	18X16	1930	0.054	0.15
680	12.5X30	2310	0.030	0.10
820	12.5X35	2510	0.025	0.083
820	16X20	2210	0.034	0.10
1000	12.5X40	2920	0.021	0.069
1000	16X25	2555	0.025	0.075
1000	18X20	2490	0.036	0.097
1200	16X31.5	3010	0.022	0.066
1200	18X25	2740	0.026	0.070
1500	16X35.5	3150	0.019	0.057
1800	16X40	3710	0.016	0.048
1800	18X31.5	3635	0.021	0.057
2200	18X35.5	3680	0.017	0.046
2700	18X40	3800	0.014	0.038
3300	18X40	3800	0.014	0.038

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capacitance ( $\mu$ F)	Size $\phi$ DxL(mm)	Rated voltage 63V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance ( $\Omega$ MAX)	
			20°C,100kHz	-10°C,100kHz
15	5X11	62	1.8	7.3
33	6.3X11	126	1.0	4.1
56	8X11.5	260	0.50	2.2
82	8X16	335	0.36	1.7
82	10X12.5	325	0.34	1.4
120	8X20	408	0.26	1.3
120	10X16	400	0.25	1.2
180	10X20	518	0.17	0.76
180	12.5X16	527	0.18	0.86
220	10X23	595	0.16	0.67
270	10X28	740	0.12	0.57
270	12.5X20	765	0.13	0.52
270	16X16	895	0.11	0.52
330	12.5X25	875	0.096	0.36
390	18X16	1030	0.096	0.40
470	12.5X30	1010	0.080	0.34
470	16X20	1130	0.077	0.32
560	12.5X35	1140	0.070	0.30
560	16X25	1350	0.062	0.23
680	12.5X40	1280	0.060	0.25
680	18X20	1300	0.072	0.27
820	16X31.5	1650	0.049	0.18
820	18X25	1560	0.052	0.19
1000	16X35.5	1900	0.040	0.15
1000	18X31.5	1720	0.042	0.15
1200	16X40	2130	0.036	0.13
1200	18X35.5	1890	0.036	0.13
1500	18X40	2470	0.032	0.12

capacitance ( $\mu$ F)	Size $\phi$ DxL(mm)	Rated voltage 100V		
		Rated ripple Current (mA r.m.s./105°C,100kHz)	Impedance ( $\Omega$ MAX)	
			20°C,100kHz	-10°C,100kHz
6.8	5X11	62	1.8	7.3
15	6.3X11	126	1.0	4.1
27	8X11.5	260	0.50	2.2
39	8X16	335	0.36	1.7
47	10X12.5	325	0.34	1.4
56	8X20	408	0.26	1.3
68	10X16	400	0.25	1.2
82	10X20	518	0.17	0.76
82	12.5X16	527	0.18	0.86
100	10X23	595	0.16	0.67
120	10X28	740	0.12	0.57
120	12.5X20	765	0.13	0.52
150	16X16	895	0.11	0.52
180	12.5X25	875	0.096	0.36
180	18X16	1030	0.096	0.40
220	12.5X30	1010	0.080	0.34
220	16X20	1130	0.077	0.32
270	12.5X35	1140	0.070	0.30
270	16X25	1350	0.062	0.23
330	12.5X40	1280	0.060	0.25
330	18X20	1300	0.072	0.27
390	16X31.5	1650	0.049	0.18
390	18X25	1560	0.052	0.19
470	16X35.5	1900	0.040	0.15
470	18X31.5	1720	0.042	0.15
560	16X40	2130	0.036	0.13
680	18X35.5	1890	0.036	0.13
820	18X40	2470	0.032	0.12



◆Table-2 PERFORMANCE

ITEMS		PERFORMANCE																										
1	Rated Voltage(WV) Surge Voltage (SV)	<table border="1"> <tr> <td>WV(V.DC)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>SV(V.DC)</td> <td>8</td> <td>13</td> <td>20</td> <td>32</td> <td>44</td> <td>63</td> <td>79</td> <td>125</td> </tr> </table>									WV(V.DC)	6.3	10	16	25	35	50	63	100	SV(V.DC)	8	13	20	32	44	63	79	125
WV(V.DC)	6.3	10	16	25	35	50	63	100																				
SV(V.DC)	8	13	20	32	44	63	79	125																				
2	Capacitance (Tolerance)	<p>&lt;Condition&gt;</p> <p>Measuring Frequency : 120Hz±20% Measuring Voltage : Not more than 0.5Vrms Measuring Temperature : 20 ± 2 °C</p> <p>&lt;Criteria&gt; 6.8 to 18000μF (±20%)</p>																										
3	Leakage Current	<p>&lt;Condition&gt;</p> <p>The rated voltage shall be applied between terminals of capacitor such that the terminal voltage will reach the rated voltage within one minute and the leakage current shall be measured at 2 minutes after the voltage has reached the rated voltage across a 1000 ±10 Ω series protection resistor. Then the current value shall not exceed value calculated from following formula.</p> <p>&lt;Criteria&gt;</p> <p><math>I=0.01CV</math> or 3μA whichever is greater where I : Leakage current in μA. C : Nominal capacitance in μF. V : Rated voltage in V.DC.</p>																										
4	Dissipation Factor (tanδ:Tangent of loss angle)	<p>&lt;Condition&gt;</p> <p>See ITEM 2, Nominal Capacitance, for measuring frequency, voltage and temperature.</p> <p>&lt;Criteria&gt;</p> <table border="1"> <tr> <td>WV(V.DC)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>tanδ</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.09</td> <td>0.08</td> </tr> </table> <p>When nominal capacitance is over 1000μF, tanδ shall be added 0.02 to the listed value with increase of every 1000μF.</p>									WV(V.DC)	6.3	10	16	25	35	50	63	100	tanδ	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08
WV(V.DC)	6.3	10	16	25	35	50	63	100																				
tanδ	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08																				
5	Terminal Strength	<p>&lt;Condition&gt;</p> <p>•Tensile Strength of Terminals The body of capacitor shall be fixed and the tensile force of following table shall be applied to the terminal in lead out direction of the terminal for 10±1 seconds.</p> <p>•Bending Strength of Terminals The body of capacitor shall be held in such a way that the regular lead-out axis of lead wire terminal becomes vertical. The weight of following table shall be suspended from the end of terminal. In this condition, after the body of sample is bent through 90 degrees, it shall be returned to the original position. Next the body shall be reversibly bent through 90 degrees and again returned to the original position.</p> <table border="1"> <tr> <td>Diameter of lead wire</td> <td>Tensile force N{kgf}</td> <td>Bending force N{kgf}</td> </tr> <tr> <td>0.5mm and less</td> <td>5{0.51}</td> <td>2.5{0.25}</td> </tr> <tr> <td>Over 0.5mm to 0.8mm incl</td> <td>10{1.0}</td> <td>5 {0.51}</td> </tr> </table> <p>&lt;Criteria&gt; Notable changes shall not be found, as breakage or looseness in the terminal.</p>									Diameter of lead wire	Tensile force N{kgf}	Bending force N{kgf}	0.5mm and less	5{0.51}	2.5{0.25}	Over 0.5mm to 0.8mm incl	10{1.0}	5 {0.51}									
Diameter of lead wire	Tensile force N{kgf}	Bending force N{kgf}																										
0.5mm and less	5{0.51}	2.5{0.25}																										
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6	Temperature Coefficient and Drift	<p>&lt;Condition&gt;</p> <table border="1" data-bbox="544 360 1342 685"> <thead> <tr> <th>STEP</th> <th>Testing Temperature (°C)</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20±2</td> <td rowspan="6">Time to reach thermal equilibrium</td> </tr> <tr> <td>2</td> <td>-40±3</td> </tr> <tr> <td>3</td> <td>-25±3</td> </tr> <tr> <td>4</td> <td>20±2</td> </tr> <tr> <td>5</td> <td>105±2</td> </tr> <tr> <td>6</td> <td>20±2</td> </tr> </tbody> </table> <p>Capacitance, D.F. and Impedance shall be measured at 120Hz.</p> <p>&lt;Criteria&gt;</p> <table border="1" data-bbox="544 770 1477 1032"> <tbody> <tr> <td>STEP 2,3</td> <td>Impedance Ratio</td> <td>The value of ratio to STEP 1 not more than value of following table.</td> </tr> <tr> <td rowspan="3">STEP 5</td> <td>Capacitance Change</td> <td>Within ±25% of the value of STEP 1</td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than the specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Not more than 8 times the specified value</td> </tr> <tr> <td rowspan="3">STEP 6</td> <td>Capacitance Change</td> <td>Within ±10% of the value of STEP 1</td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than the specified value</td> </tr> <tr> <td>Leakage Current</td> <td>Not more than the specified value</td> </tr> </tbody> </table> <table border="1" data-bbox="544 1055 1305 1193"> <tbody> <tr> <td>WV(V.DC)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>Z(-25°C)/Z(+20°C)</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z(-40°C)/Z(+20°C)</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> <td>3</td> </tr> </tbody> </table>	STEP	Testing Temperature (°C)	Time	1	20±2	Time to reach thermal equilibrium	2	-40±3	3	-25±3	4	20±2	5	105±2	6	20±2	STEP 2,3	Impedance Ratio	The value of ratio to STEP 1 not more than value of following table.	STEP 5	Capacitance Change	Within ±25% of the value of STEP 1	Dissipation Factor	Not more than the specified value	Leakage Current	Not more than 8 times the specified value	STEP 6	Capacitance Change	Within ±10% of the value of STEP 1	Dissipation Factor	Not more than the specified value	Leakage Current	Not more than the specified value	WV(V.DC)	6.3	10	16	25	35	50	63	100	Z(-25°C)/Z(+20°C)	4	3	2	2	2	2	2	2	Z(-40°C)/Z(+20°C)	8	6	4	3	3	3	3	3
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7	Load Life Test	<p>&lt;Condition&gt;</p> <p>Capacitor under the test shall be applied the rated voltage continuously through 1000 Ω series protective resistor (with maximum ripple current) at 105±2°C for following test period. After the test and returned in standard condition for 1 to 2 hours, and the capacitor shall meet following requirements.</p> <table border="1" data-bbox="544 1346 1134 1559"> <thead> <tr> <th rowspan="2">Case dia</th> <th colspan="2">Life time</th> </tr> <tr> <th>6.3 to 10WV</th> <th>16 to 100WV</th> </tr> </thead> <tbody> <tr> <td>φ5, φ6.3</td> <td>4000 <sup>+72</sup><sub>0</sub></td> <td>5000 <sup>+72</sup><sub>0</sub></td> </tr> <tr> <td>φ8, φ10</td> <td>6000 <sup>+72</sup><sub>0</sub></td> <td>7000 <sup>+72</sup><sub>0</sub></td> </tr> <tr> <td>φ12.5 to φ18</td> <td>8000 <sup>+72</sup><sub>0</sub></td> <td>10000 <sup>+72</sup><sub>0</sub></td> </tr> </tbody> </table> <p>&lt;Criteria&gt;</p> <table border="1" data-bbox="544 1608 1477 1742"> <tbody> <tr> <td>Leakage Current</td> <td>Not more than the specified value</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±25% of the initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than 200% of the specified value</td> </tr> <tr> <td>Appearance</td> <td>Notable changes shall not be found, except sleeve</td> </tr> </tbody> </table>	Case dia	Life time		6.3 to 10WV	16 to 100WV	φ5, φ6.3	4000 <sup>+72</sup> <sub>0</sub>	5000 <sup>+72</sup> <sub>0</sub>	φ8, φ10	6000 <sup>+72</sup> <sub>0</sub>	7000 <sup>+72</sup> <sub>0</sub>	φ12.5 to φ18	8000 <sup>+72</sup> <sub>0</sub>	10000 <sup>+72</sup> <sub>0</sub>	Leakage Current	Not more than the specified value	Capacitance Change	Within ±25% of the initial value	Dissipation Factor	Not more than 200% of the specified value	Appearance	Notable changes shall not be found, except sleeve																																						
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8	Shelf Life Test	<p>&lt;Condition&gt; Capacitors shall be stored at 105±2°C with no voltage applied for 1000<sup>+48</sup><sub>0</sub> hours. After the test and returned in standard condition for 1 to 2 hours and the capacitor shall meet following requirements. (If any doubt arises on the judgment, the capacitors shall be subjected to voltage treatment specified in JIS C 5141,5.2.)</p> <p>&lt;Criteria&gt;</p> <table border="1" data-bbox="533 517 1477 667"> <tr> <td>Leakage Current</td> <td>Not more than the specified value</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±25% of the initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than 200% of the specified value</td> </tr> <tr> <td>Appearance</td> <td>Notable changes shall not be found</td> </tr> </table>	Leakage Current	Not more than the specified value	Capacitance Change	Within ±25% of the initial value	Dissipation Factor	Not more than 200% of the specified value	Appearance	Notable changes shall not be found		
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9	Surge Voltage	<p>&lt;Condition&gt; Capacitor shall be applied the surge voltage through a (100±50)/C<sub>R</sub> [kΩ] resistor in series for 30±5 seconds in every 6±0.5 minutes at 15 to 35°C. Procedure shall be repeated 1000 times. Then the capacitors shall be left under normal humidity for 1 to 2 hours before measurement. [C<sub>R</sub> : Nominal Capacitance (μF)]</p> <p>&lt;Criteria&gt;</p> <table border="1" data-bbox="533 898 1477 1048"> <tr> <td>Leakage Current</td> <td>Not more than the specified value</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±15% of the initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than the specified value</td> </tr> <tr> <td>Appearance</td> <td>Notable changes shall not be found</td> </tr> </table> <p>◇This test simulates over voltage at abnormal situations, and not be hypothesizing that over voltage is always applied.</p>	Leakage Current	Not more than the specified value	Capacitance Change	Within ±15% of the initial value	Dissipation Factor	Not more than the specified value	Appearance	Notable changes shall not be found		
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10	Vibration Test	<p>&lt;Condition&gt; Testing shall be done out in 3 AXIS for 2 hours each (total 6 hours) as below. Fix lead wire at a point not more than 4mm from the body , use mounting device separately for the one with a diameter 12.5mm and greater or with a length 25mm and longer.</p> <table border="1" data-bbox="533 1272 1136 1361"> <tr> <td>Vibration frequency range</td> <td>: 10 to 55Hz</td> </tr> <tr> <td>Peak to peak amplitude</td> <td>: 1.5mm</td> </tr> <tr> <td>Sweep rate</td> <td>: 10 to 55 to 10Hz, In about 1min.</td> </tr> </table> <p>&lt;Criteria&gt;</p> <table border="1" data-bbox="533 1406 1477 1485"> <tr> <td>Capacitance Change</td> <td>Within ±5% of the initial value</td> </tr> <tr> <td>Appearance</td> <td>Notable changes shall not be found</td> </tr> </table>	Vibration frequency range	: 10 to 55Hz	Peak to peak amplitude	: 1.5mm	Sweep rate	: 10 to 55 to 10Hz, In about 1min.	Capacitance Change	Within ±5% of the initial value	Appearance	Notable changes shall not be found
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11	Solderability	<p>&lt;Condition&gt; Terminals of the capacitor shall be immersed in flux (ethanol solution of the rosin, 25 wt% rosin) and shall be immersed in the solder bath (Sn96.5Ag3.0Cu0.5, 245±5°C) and held for 3±0.3 seconds, and pulled out at the same speed.</p> <p>&lt;Criteria&gt; At least 3/4 of circumferential surface of dipped portion of the terminal shall be covered with new solder.</p>										

12	Resistance to Solder Heat	<p>&lt;Condition&gt;            Terminals of the capacitor shall be immersed into solder bath at 260±5°C for 10±1 seconds up to 1.5 to 2.0mm from the body of capacitor.            Then the capacitors shall be left under the normal temperature and normal humidity for 1 to 2 hours before measurement.</p> <p>&lt;Criteria&gt;</p> <table border="1" data-bbox="531 499 1477 645"> <tr> <td>Leakage Current</td> <td>Not more than the specified value</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±10% of the initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than the specified value</td> </tr> <tr> <td>Appearance</td> <td>Notable changes shall not be found</td> </tr> </table>	Leakage Current	Not more than the specified value	Capacitance Change	Within ±10% of the initial value	Dissipation Factor	Not more than the specified value	Appearance	Notable changes shall not be found																																
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13	Resistance to Damp Heat (Steady State)	<p>&lt;Condition&gt;            Capacitor shall be stored in the ambient of 40±2°C and relative humidity 90 to 95% for 240±8 hours.            Then the capacitors shall be left under the normal temperature and normal humidity for 1 to 2 hours before measurement.</p> <p>&lt;Criteria&gt;</p> <table border="1" data-bbox="531 846 1477 992"> <tr> <td>Leakage Current</td> <td>Not more than the specified value</td> </tr> <tr> <td>Capacitance Change</td> <td>Within ±15% of the initial value</td> </tr> <tr> <td>Dissipation Factor</td> <td>Not more than the specified value</td> </tr> <tr> <td>Appearance</td> <td>Notable changes shall not be found</td> </tr> </table>	Leakage Current	Not more than the specified value	Capacitance Change	Within ±15% of the initial value	Dissipation Factor	Not more than the specified value	Appearance	Notable changes shall not be found																																
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14	Rated ripple Current	<p>(1)The Rated ripple current is the maximum A.C. current at 100kHz and can be applied at maximum operating temperature.            (2)The combined value of D.C. voltage and the peak A.C. voltage shall not exceed the rated voltage and shall not be reverse voltage.</p> <p>&lt;Frequency Coefficient&gt;</p> <table border="1" data-bbox="531 1193 1394 1368"> <thead> <tr> <th colspan="2">Frequency(Hz)</th> <th>120</th> <th>1k</th> <th>10k</th> <th>100k≤</th> </tr> </thead> <tbody> <tr> <td rowspan="5">Coefficient</td> <td>6.8 to 33μF</td> <td>0.42</td> <td>0.70</td> <td>0.90</td> <td>1.00</td> </tr> <tr> <td>39 to 270μF</td> <td>0.50</td> <td>0.73</td> <td>0.92</td> <td>1.00</td> </tr> <tr> <td>330 to 680μF</td> <td>0.55</td> <td>0.77</td> <td>0.94</td> <td>1.00</td> </tr> <tr> <td>820 to 1800μF</td> <td>0.60</td> <td>0.80</td> <td>0.96</td> <td>1.00</td> </tr> <tr> <td>2200 to 8200μF</td> <td>0.70</td> <td>0.85</td> <td>0.98</td> <td>1.00</td> </tr> </tbody> </table> <p>&lt; Temperature Coefficient &gt;</p> <table border="1" data-bbox="531 1417 1174 1476"> <tr> <td>Ambient Temperature(°C)</td> <td>105</td> <td>85</td> <td>65≥</td> </tr> <tr> <td>Coefficient</td> <td>1.0</td> <td>1.7</td> <td>2.1</td> </tr> </table> <p>◇Temperature coefficient shows a limit of ripple current exceeding the rated ripple current that can be passed through a capacitor at each temperature when the life expectancy of a capacitor becomes to be nearly equal with the lifetime at the rated maximum operating temperature.            ◇Use of aluminum electrolytic capacitor under ripple voltage with wide amplitude is equivalent to quick charge-discharge operation.            When ripple voltage with the amplitude over 70Vp-p is expected for the products with rated voltage over 100V, please contact us.</p>	Frequency(Hz)		120	1k	10k	100k≤	Coefficient	6.8 to 33μF	0.42	0.70	0.90	1.00	39 to 270μF	0.50	0.73	0.92	1.00	330 to 680μF	0.55	0.77	0.94	1.00	820 to 1800μF	0.60	0.80	0.96	1.00	2200 to 8200μF	0.70	0.85	0.98	1.00	Ambient Temperature(°C)	105	85	65≥	Coefficient	1.0	1.7	2.1
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## 10. Halogen free Specification

All homogeneous materials within capacitor shall meet the criteria in the following table. A homogeneous material has uniform composition throughout and cannot be mechanically disjointed into different materials.

<Criteria>	
Substances	Permissible Limit (by weight)
Bromine (Br)	≤900 ppm
Chlorine (Cl)	≤900 ppm
Total concentration of Br+Cl	≤1500 ppm

## Notes on use of aluminum electrolytic capacitors

## (1) Charge and discharge

Do not use for the circuit that repeats quick charge or discharge.

## (2) External stress

Do not apply excessive force of pushing, pulling bending, and/or twisting to the main body, lead wire and terminals.

## (3) Heat resistance at soldering process

In the soldering process of PC board with Capacitors mounted, secondary shrinkage or crack of sleeve may be observed when soldering temperature is too high and /or soldering time is too long.

If lead wire of other components or pattern of double sided PC board touches the capacitor, the similar failure may be also originated at pre-heating, heating at hardening process of adhesive and soldering process.

## (4) Insulation and PC board mounting

Sleeve is for marking purpose only.

It is not recognized as insulation materials.

When double sided PC board is employed, note that it could cause a short circuit if lead wire of other components or pattern of double sided PC board touches capacitor. Please avoid circuit pattern runs underneath capacitor.

In addition, case and cathode terminal are not insulated.

## (5) Adhesives and coating materials

Do not use the adhesives and coating materials that contain halogenated organic solvents or chloroprene as polymer.

## (6) Storage

Keep at a normal temperature and humidity. During a long storage time, leakage current will be increased. To prevent heat rise or any trouble that high leakage current possibly causes, voltage treatment is recommended for the capacitors that have been stored for a long time.

## &lt;Storage Condition&gt;

\*Aluminum electrolytic capacitors should not be stored in high temperatures or where there is a high level of humidity. The suitable storage condition is 5°C-35°C and less than 75% in relative humidity.

\*Aluminum electrolytic capacitors should not be stored in damp conditions such as water, saltwater spray or oil spray.

\*Do not store aluminum electrolytic capacitors in an environment full of hazardous gas (hydrogen sulfide, sulfurous acid gas, nitrous acid, chlorine gas, ammonia or bromine gas).

\*Aluminum electrolytic capacitors should not be stored under exposure to ozone, ultraviolet rays or radiation.

## (7) Fumigation and halogenated flame retardant

It may cause corrosion of internal electrodes, aluminum cases and terminal surface when the following conditions exist.

\*Fumigation of wooden pallets before shipment to disinfect vermin.

\*Existence of components or parts that contain halogenated flame retardant agent (bromine etc.) together with capacitors.

\*When halogenated detergents of antiseptics for preventing infection of epidemic diseases contact directly to capacitors.

## (8) PC board cleaning after soldering

Please consult us when cleaning is subjected.

## ◆Guide to application except the above are described in our catalog and EIAJ RCR-2367C.

EIAJ RCR-2367C : "Safety Application Guide for fixed aluminum electrolytic capacitors for use in electronic equipment."

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