

**ELNA**

**TYPE RSH**

ED-8801C

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS  
FOR SWITCHING REGULATORS AND OTHER HIGH FREQUENCY APPLICATIONS.

◆ Highlights

Series name	Terminal	Working temperature range(°C)	Rated Voltage range(V)	Capacitance range (μF)	Guaranteed Time at 105°C (hour)						
RSH	Radial lead type	-55~ +105	6.3~100	0.47 ~ 15000	<table border="0"> <tr> <td>φ 5~6.3</td> <td>:2000</td> </tr> <tr> <td>φ 8~10</td> <td>:3000</td> </tr> <tr> <td>φ 12.5~18</td> <td>:5000</td> </tr> </table>	φ 5~6.3	:2000	φ 8~10	:3000	φ 12.5~18	:5000
φ 5~6.3	:2000										
φ 8~10	:3000										
φ 12.5~18	:5000										

◆ Key Features

- Low Impedance, Low ESR
- High Ripple Current Capability
- Wide Operating Temperature Range
- Excellent Temperature Stability
- Wide Variety of Case Size

◆ Applications

Switching regulators, High Frequency coupling, By-pass circuits

MARATHONCAP

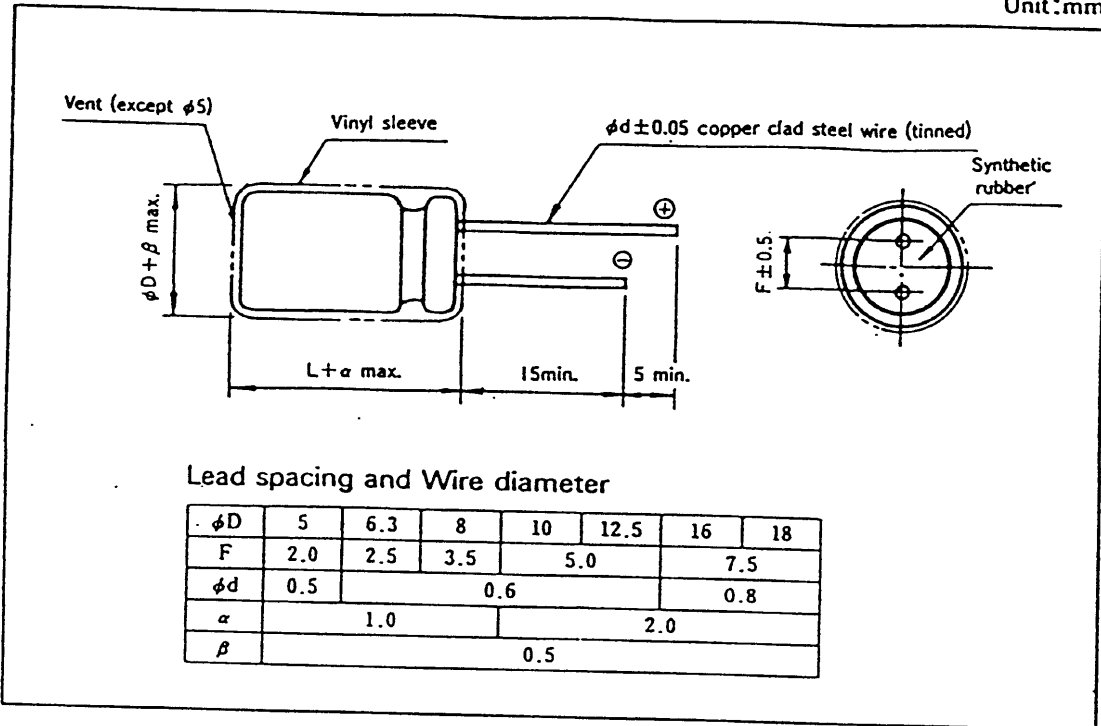
MARATHONCAP is the affectionate name given to the aluminum electrolytic capacitors of long life and high reliability developed for smoothing high frequencies of power supply, and for use in control circuits. The capacitors are suitable for use in switching regulators in which internal temperature is actually raised, or in other electronic equipment, and aid in the design of small-size and highly reliable equipment.



# R S H C O N F I G U R A T I O N S

## ● Radial lead type

Unit:mm



Lead spacing and Wire diameter

$\phi D$	5	6.3	8	10	12.5	16	18
F	2.0	2.5	3.5	5.0		7.5	
$\phi d$	0.5	0.6			0.8		
$\alpha$	1.0			2.0			
$\beta$	0.5						

Standard Ratings

Case φD×L(mm)	Parameter Case code	WV(V)		35			50		
		Capacitance μF	Impedance Ω/100kHz		Ripple current mA <sub>rms</sub>	Capacitance μF	Impedance Ω/100kHz		Ripple current mA <sub>rms</sub>
			20°C	-10°C			20°C	-10°C	
5×11.5	A21	—	—	—	—	—	—	—	
5×11.5	A21	—	—	—	0.47	3.9	7.8	22	
5×11.5	A21	—	—	—	1	3.5	7.0	36	
5×11.5	A21	—	—	—	2.2	3.0	6.0	54	
5×11.5	A21	—	—	—	3.3	2.6	5.2	63	
5×11.5	A21	—	—	—	4.7	2.2	4.4	75	
5×11.5	A21	27	0.65	1.3	10	1.4	2.8	110	
5×15	A22	39	0.46	0.92	18	0.95	1.9	120	
6.3×11.5	A31	56	0.30	0.60	27	0.55	1.1	135	
6.3×15	A32	82	0.20	0.40	39	0.36	0.72	148	
8×12	A41	120	0.17	0.34	400	0.28	0.56	153	
8×15	A42	180	0.13	0.26	506	0.20	0.40	360	
8×20	A43	220	0.095	0.19	637	0.18	0.36	460	
10×12.5	A51	150	0.12	0.24	760	0.13	0.26	670	
10×16	A52	180	0.095	0.19	635	0.18	0.36	443	
10×20	A53	330	0.065	0.13	795	0.15	0.30	553	
10×25	A54	390	0.055	0.11	1010	0.085	0.17	676	
10×30	A55	560	0.045	0.090	1190	0.075	0.15	876	
12.5×15	A61	330	0.065	0.13	1010	0.055	0.11	1010	
12.5×20	A62	560	0.042	0.084	1400	0.095	0.19	745	
12.5×25	A63	680	0.038	0.076	1690	0.060	0.12	979	
12.5×30	A64	1000	0.032	0.064	1950	0.044	0.088	1180	
12.5×35	A65	1200	0.028	0.056	2200	0.040	0.080	1310	
12.5×40	A66	1500	0.026	0.052	2390	0.036	0.072	1470	
16×15	A71	560	0.046	0.092	1360	0.034	0.068	1590	
16×20	A72	1000	0.034	0.068	1730	0.065	0.13	982	
16×25	A73	1200	0.028	0.056	2070	0.045	0.090	1210	
16×31.5	A74	1800	0.025	0.050	2350	0.038	0.076	1490	
16×35.5	A75	2200	0.022	0.044	2550	0.032	0.064	1890	
16×40	A76	2700	0.020	0.040	2900	0.028	0.056	2140	
18×15	A81	680	0.043	0.086	1520	0.026	0.052	2110	
18×20	A82	1200	0.036	0.072	1900	0.048	0.096	1080	
18×25	A83	1800	0.027	0.054	2200	0.036	0.072	1450	
18×31.5	A84	2200	0.023	0.046	2490	0.032	0.064	1720	
18×35.5	A85	2700	0.019	0.038	2770	0.026	0.052	1970	
18×40	A86	3300	0.018	0.036	3110	0.025	0.050	2310	
					2200	0.024	0.048	2530	

Case φD×L(mm)	Parameter Case code	WV(V)		63			100		
		Capacitance μF	Impedance Ω/100kHz		Ripple current mA <sub>rms</sub>	Capacitance μF	Impedance Ω/100kHz		Ripple current mA <sub>rms</sub>
			20°C	-10°C			20°C	-10°C	
5×11.5	A21	12	1.2	3.6	120	5.6	7.6	57	
5×15	A22	18	0.85	2.6	135	8.2	5.2	74	
6.3×11.5	A31	27	0.55	1.7	148	1.3	5.2	74	
6.3×15	A32	39	0.38	1.1	153	1.1	4.4	78	
8×12	A41	47	0.32	0.96	360	18	0.62	2.5	85
8×15	A42	68	0.24	0.72	469	22	0.53	2.1	275
8×20	A43	82	0.17	0.51	682	33	0.35	1.4	360
10×12.5	A51	56	0.23	0.69	448	39	0.27	1.1	490
10×16	A52	68	0.17	0.51	553	27	0.47	1.9	319
10×20	A53	120	0.12	0.36	676	33	0.32	1.3	424
10×25	A54	150	0.10	0.30	876	56	0.25	1.0	490
10×30	A55	180	0.085	0.26	1020	68	0.18	0.72	634
12.5×15	A61	150	0.11	0.33	745	100	0.15	0.60	739
12.5×20	A62	220	0.075	0.23	979	68	0.20	0.80	613
12.5×25	A63	270	0.065	0.20	1180	100	0.13	0.52	805
12.5×30	A64	390	0.055	0.17	1310	120	0.11	0.44	857
12.5×35	A65	470	0.048	0.14	1470	180	0.090	0.36	1120
12.5×40	A66	560	0.042	0.13	1590	220	0.075	0.30	1240
16×15	A71	220	0.080	0.24	982	270	0.060	0.24	1330
16×20	A72	390	0.057	0.17	1210	120	0.13	0.52	706
16×25	A73	470	0.052	0.16	1490	180	0.11	0.44	916
16×31.5	A74	680	0.042	0.13	1890	220	0.081	0.32	1290
16×35.5	A75	820	0.036	0.11	2140	330	0.059	0.23	1630
16×40	A76	1000	0.032	0.11	2400	390	0.052	0.21	1750
18×15	A81	330	0.065	0.096	2410	470	0.045	0.18	1920
18×20	A82	470	0.058	0.17	1460	150	0.12	0.48	871
18×25	A83	680	0.050	0.15	1740	270	0.085	0.34	1170
18×31.5	A84	820	0.042	0.13	1900	330	0.071	0.28	1500
18×35.5	A85	1000	0.035	0.11	2340	390	0.058	0.23	1630
18×40	A86	1200	0.032	0.096	2560	560	0.054	0.22	1920
						680	0.041	0.16	2100

Note : Allowable ripple current : 105°C, 100kHz Impedance : at 20°C.

Standard Ratings

Case # (D) x L (mm)	Parameter Case code	WV (V)		6.3			10		
		Capacitance $\mu F$	Impedance $\Omega/100kHz$		Ripple current mA rms	Capacitance $\mu F$	Impedance $\Omega/100kHz$		Ripple current mA rms
			20°C	-10°C			20°C	-10°C	
5 x 11.5	A21	100	0.65	1.3	175	82	0.65	1.3	175
5 x 15	A22	150	0.46	0.92	235	100	0.46	0.92	235
6.3 x 11.5	A31	220	0.30	0.60	290	180	0.31	0.62	290
6.3 x 15	A32	330	0.20	0.40	400	220	0.20	0.40	400
8 x 12	A41	470	0.17	0.34	488	330	0.17	0.34	490
8 x 15	A42	680	0.13	0.26	617	470	0.13	0.26	617
8 x 20	A43	1000	0.095	0.19	800	680	0.095	0.19	800
10 x 12.5	A51	680	0.12	0.24	613	470	0.12	0.24	620
10 x 16	A52	820	0.095	0.19	734	560	0.095	0.19	734
10 x 20	A53	1200	0.065	0.13	1010	1000	0.060	0.12	1010
10 x 25	A54	1500	0.055	0.11	1190	1200	0.055	0.11	1190
10 x 30	A55	2200	0.045	0.090	1440	1500	0.045	0.090	1440
12.5 x 15	A61	1200	0.065	0.13	1010	1000	0.065	0.13	1010
12.5 x 20	A62	2200	0.042	0.084	1400	1800	0.042	0.084	1400
12.5 x 25	A63	2700	0.038	0.076	1690	2200	0.036	0.072	1690
12.5 x 30	A64	3900	0.032	0.064	1950	2700	0.032	0.064	1950
12.5 x 35	A65	4700	0.028	0.056	2220	3300	0.028	0.056	2220
12.5 x 40	A66	5600	0.026	0.052	2390	3900	0.025	0.050	2390
16 x 15	A71	2700	0.046	0.092	1310	1800	0.046	0.092	1310
16 x 20	A72	4700	0.034	0.068	1660	3300	0.034	0.068	1660
16 x 25	A73	5600	0.028	0.056	2070	3900	0.028	0.056	2070
16 x 31.5	A74	6800	0.025	0.050	2350	5600	0.025	0.050	2350
16 x 35.5	A75	8200	0.022	0.044	2550	6800	0.022	0.044	2550
16 x 40	A76	12000	0.020	0.040	2970	8200	0.020	0.040	2970
18 x 15	A81	3300	0.043	0.086	1460	2200	0.043	0.086	1460
18 x 20	A82	5600	0.030	0.060	1850	3900	0.030	0.060	1850
18 x 25	A83	6800	0.027	0.054	2120	4700	0.027	0.054	2120
18 x 31.5	A84	10000	0.023	0.046	2410	6800	0.023	0.046	2410
18 x 35.5	A85	12000	0.019	0.038	2680	8200	0.019	0.038	2680
18 x 40	A86	15000	0.018	0.036	3010	10000	0.018	0.036	3010

Case # (D) x L (mm)	Parameter Case code	WV (V)		16			25		
		Capacitance $\mu F$	Impedance $\Omega/100kHz$		Ripple current mA rms	Capacitance $\mu F$	Impedance $\Omega/100kHz$		Ripple current mA rms
			20°C	-10°C			20°C	-10°C	
5 x 11.5	A21	56	0.65	1.3	175	39	0.65	1.3	175
5 x 15	A22	82	0.46	0.92	235	56	0.46	0.92	235
6.3 x 11.5	A31	120	0.31	0.62	290	82	0.31	0.62	290
6.3 x 15	A32	180	0.20	0.40	400	120	0.20	0.40	400
8 x 12	A41	270	0.17	0.34	501	180	0.17	0.34	503
8 x 15	A42	330	0.13	0.26	575	220	0.13	0.26	575
8 x 20	A43	470	0.095	0.19	760	330	0.095	0.19	751
10 x 12.5	A51	330	0.13	0.26	625	220	0.12	0.24	629
10 x 16	A52	390	0.090	0.18	795	270	0.090	0.18	795
10 x 20	A53	680	0.065	0.13	1010	470	0.065	0.13	1010
10 x 25	A54	820	0.055	0.11	1190	560	0.055	0.11	1190
10 x 30	A55	1200	0.047	0.094	1430	820	0.045	0.090	1440
12.5 x 15	A61	680	0.065	0.13	1010	470	0.065	0.13	1010
12.5 x 20	A62	1200	0.042	0.084	1400	820	0.042	0.084	1400
12.5 x 25	A63	1500	0.038	0.076	1690	1000	0.036	0.072	1690
12.5 x 30	A64	2200	0.032	0.064	1950	1500	0.030	0.060	1950
12.5 x 35	A65	2700	0.028	0.056	2200	1800	0.028	0.056	2200
12.5 x 40	A66	3300	0.026	0.052	2390	2200	0.024	0.048	2390
16 x 15	A71	1500	0.046	0.092	1340	820	0.046	0.092	1360
16 x 20	A72	2200	0.034	0.068	1730	1500	0.034	0.068	1730
16 x 25	A73	2700	0.028	0.056	2070	1800	0.028	0.056	2070
16 x 31.5	A74	3900	0.025	0.050	2350	2700	0.025	0.050	2350
16 x 35.5	A75	4700	0.022	0.044	2550	3300	0.022	0.044	2550
16 x 40	A76	5600	0.020	0.040	2900	3900	0.020	0.040	2900
18 x 15	A81	1500	0.043	0.086	1490	1200	0.043	0.086	1500
18 x 20	A82	2700	0.030	0.060	1870	1800	0.036	0.072	1890
18 x 25	A83	3900	0.027	0.054	2160	2700	0.027	0.054	2180
18 x 31.5	A84	4700	0.023	0.046	2450	3300	0.023	0.046	2470
18 x 35.5	A85	6600	0.019	0.038	2730	3900	0.019	0.038	2740
18 x 40	A86	8200	0.018	0.036	3060	4700	0.018	0.036	3070

Note: Allowable ripple current: 105°C, 100kHz. Impedance: at 20°C.

**ELNA****TYPE RSH**ED-8801

## TABLE OF STANDARDS

No.	Item	Performance																		
1	Working temp. range	-55 to +105°C																		
2	Voltage range	6.3 to 100 V																		
3	Cap. tolerance	± 20%																		
4	Leakage current	Less than 0.01CV ( $\mu$ A) after 2min.: C; Capacitance, V; Rated voltage																		
5	Tangent of loss angle(120Hz)	<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>6.3 V</th> <th>10 V</th> <th>16 V</th> <th>25 V</th> <th>35 V</th> <th>50 V</th> <th>63 V</th> <th>100 V</th> </tr> </thead> <tbody> <tr> <td>Tan <math>\delta</math></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>0.08</td> <td>0.07</td> </tr> </tbody> </table>	Rated voltage	6.3 V	10 V	16 V	25 V	35 V	50 V	63 V	100 V	Tan $\delta$	0.22	0.19	0.16	0.14	0.12	0.10	0.08	0.07
		Rated voltage	6.3 V	10 V	16 V	25 V	35 V	50 V	63 V	100 V										
Tan $\delta$	0.22	0.19	0.16	0.14	0.12	0.10	0.08	0.07												
For those in excess of 1,000 $\mu$ F, 0.02 is added to the value every increase of 1,000 $\mu$ F.																				
6	Temperature characteristic	<table border="1"> <thead> <tr> <th>Item</th> <th>Voltage</th> <th>6.3V</th> <th>10~100V</th> </tr> </thead> <tbody> <tr> <td>Capacitance(120Hz): <math>\Delta C/C(-55^{\circ}C/20^{\circ}C)</math></td> <td></td> <td>± 30%</td> <td>± 20%</td> </tr> <tr> <td>Impedance ratio : Z/Z (-55°C/20°C)</td> <td></td> <td colspan="2">Less than 3</td> </tr> </tbody> </table>	Item	Voltage	6.3V	10~100V	Capacitance(120Hz): $\Delta C/C(-55^{\circ}C/20^{\circ}C)$		± 30%	± 20%	Impedance ratio : Z/Z (-55°C/20°C)		Less than 3							
		Item	Voltage	6.3V	10~100V															
		Capacitance(120Hz): $\Delta C/C(-55^{\circ}C/20^{\circ}C)$		± 30%	± 20%															
Impedance ratio : Z/Z (-55°C/20°C)		Less than 3																		
Less than the value given on the table of standards(105°C, 100kHz)																				
8	Load life characteristic (105±2°C)	<table border="1"> <tbody> <tr> <td>Test Time</td> <td><math>\phi</math> 5~6.3:2,000 hours, <math>\phi</math> 8~10:3,000 hours <math>\phi</math> 12.5~18:5,000 hours</td> </tr> <tr> <td>Leakage current</td> <td>Less than the value in item No. 4</td> </tr> <tr> <td>Capacitance change</td> <td>Within ± 20% the initial value</td> </tr> <tr> <td>Tangent of loss angle</td> <td>Less than 200% the value in item No. 5</td> </tr> </tbody> </table>	Test Time	$\phi$ 5~6.3:2,000 hours, $\phi$ 8~10:3,000 hours $\phi$ 12.5~18:5,000 hours	Leakage current	Less than the value in item No. 4	Capacitance change	Within ± 20% the initial value	Tangent of loss angle	Less than 200% the value in item No. 5										
		Test Time	$\phi$ 5~6.3:2,000 hours, $\phi$ 8~10:3,000 hours $\phi$ 12.5~18:5,000 hours																	
		Leakage current	Less than the value in item No. 4																	
		Capacitance change	Within ± 20% the initial value																	
Tangent of loss angle	Less than 200% the value in item No. 5																			
Less than the value given on the table of standards(105°C, 100kHz)																				
9	Shelf life characteristic (105±2°C)	<table border="1"> <tbody> <tr> <td>Test time</td> <td>1,000 hours</td> </tr> <tr> <td>Leakage current</td> <td>Less than the value in item No. 4</td> </tr> <tr> <td>Capacitance change</td> <td>Within ± 15% the initial value</td> </tr> <tr> <td>Tangent of loss angle</td> <td>Less than 150% the value in item No. 5</td> </tr> </tbody> </table>	Test time	1,000 hours	Leakage current	Less than the value in item No. 4	Capacitance change	Within ± 15% the initial value	Tangent of loss angle	Less than 150% the value in item No. 5										
		Test time	1,000 hours																	
		Leakage current	Less than the value in item No. 4																	
		Capacitance change	Within ± 15% the initial value																	
Tangent of loss angle	Less than 150% the value in item No. 5																			
Pretreatment performed: After the test, it shall be subjected to standard atmospheric condition of 20°C and the rated DC voltage shall be applied across it and its protective resistance for 30 min. after which it shall be discharged.																				
Less than the value given on the table of standards(105°C, 100kHz)																				



## C O N T E N T S

1. Lowering and Stabilizing impedance
  - 1.1 Lowering impedance
  - 1.2 Stabilizing low impedance at high frequency
2. Performance at high frequency
3. Solvent-proofness
4. Performance of developed capacitors "RSH series"

## 1. Lowering and Stabilizing impedance

### 1.1 Lowering impedance

Figure 1, which shows the relationship between impedance (at 100KHz) and volume using an example of capacitor rated at 10V 1000  $\mu$ F, represents that the impedance of RSH series is lower than others.

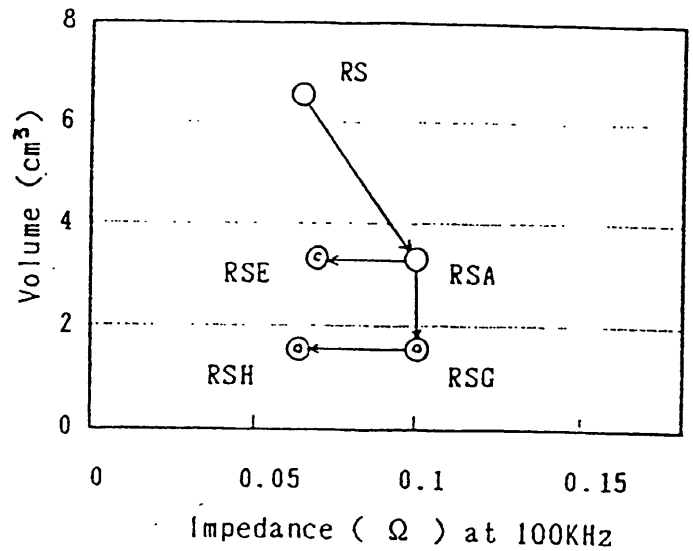


Figure 1 Volume vs. impedance at 100KHz  
(for capacitor rated at 10V 1000  $\mu$ F)

### 1.2 Stabilizing impedance at high frequency

Our company has developed an electrolyte with excellent heat-stability and low specific resistance, because life-time of aluminum electrolytic capacitor has been very influenced by heat-stability of electrolyte.

Figure 2 shows the change in specific resistance with time passage for the developed electrolyte.

The developed electrolyte B using RSH series is lower than the developed electrolyte A in initial specific resistance and has less change in specific resistance with time passage at 105°C.

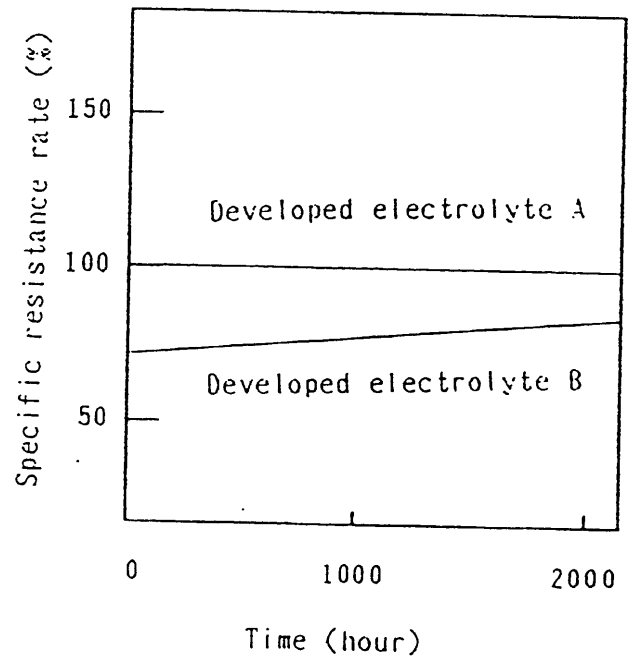


Figure 2 Long-time stability of electrolyte at 105°C (where the initial specific resistance of developed electrolyte A is taken as 100)



## 2. Performance at high frequency

Figure 3, which shows frequency characteristics of RSH series, represents that impedance of RSH series is lower than one of RSG series.

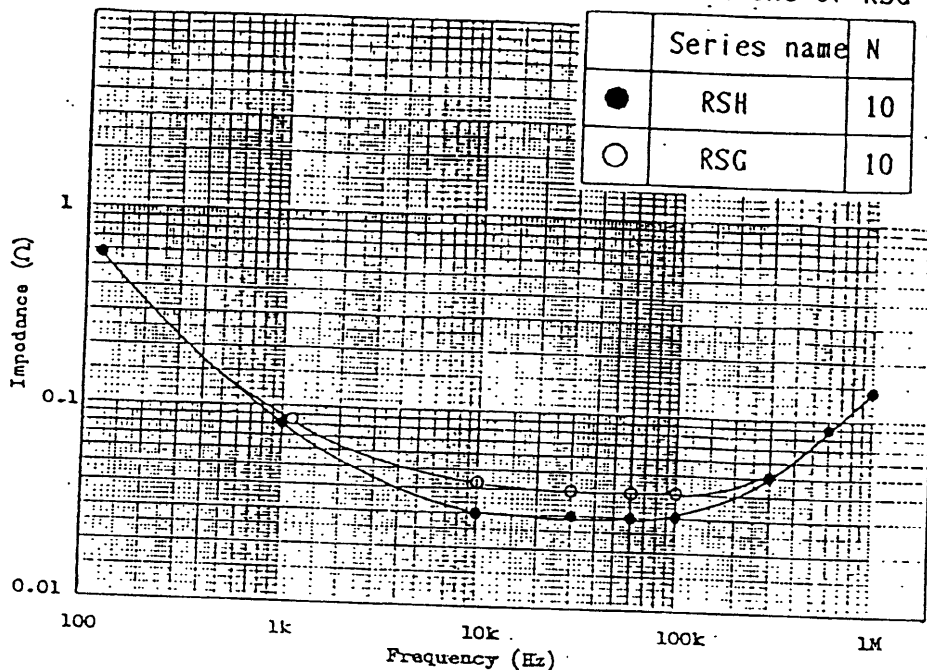


Figure 3 Frequency characteristic at 20°C  
10V2200 μF (φ 12.5 × 25L)

## 3. Solvent-proofness

Generally, aluminum electrolytic capacitors are susceptible to organic chlorine agents. Of this RSH series, the solvent-proofness is enhanced by the improvements on the electrolyte and sealing agent.

Table 1 shows the results of the high-temperature load test after capacitors are cleaned with agent. It is here apparent that RSH series is excellent in solvent-proofness.

Table 1 Solvent-proof test results

Ratings	Size	N	Test Results
25V 270 μF	φ 10 × 16L	30	At 105°C, applying rated voltage, no capacitor is defective after 2000 hours.
35V 120 μF	φ 8 × 12L	30	
50V 100 μF	φ 10 × 16L	30	
63V 18 μF	φ 5 × 11.5L	30	
100V 33 μF	φ 10 × 16L	30	

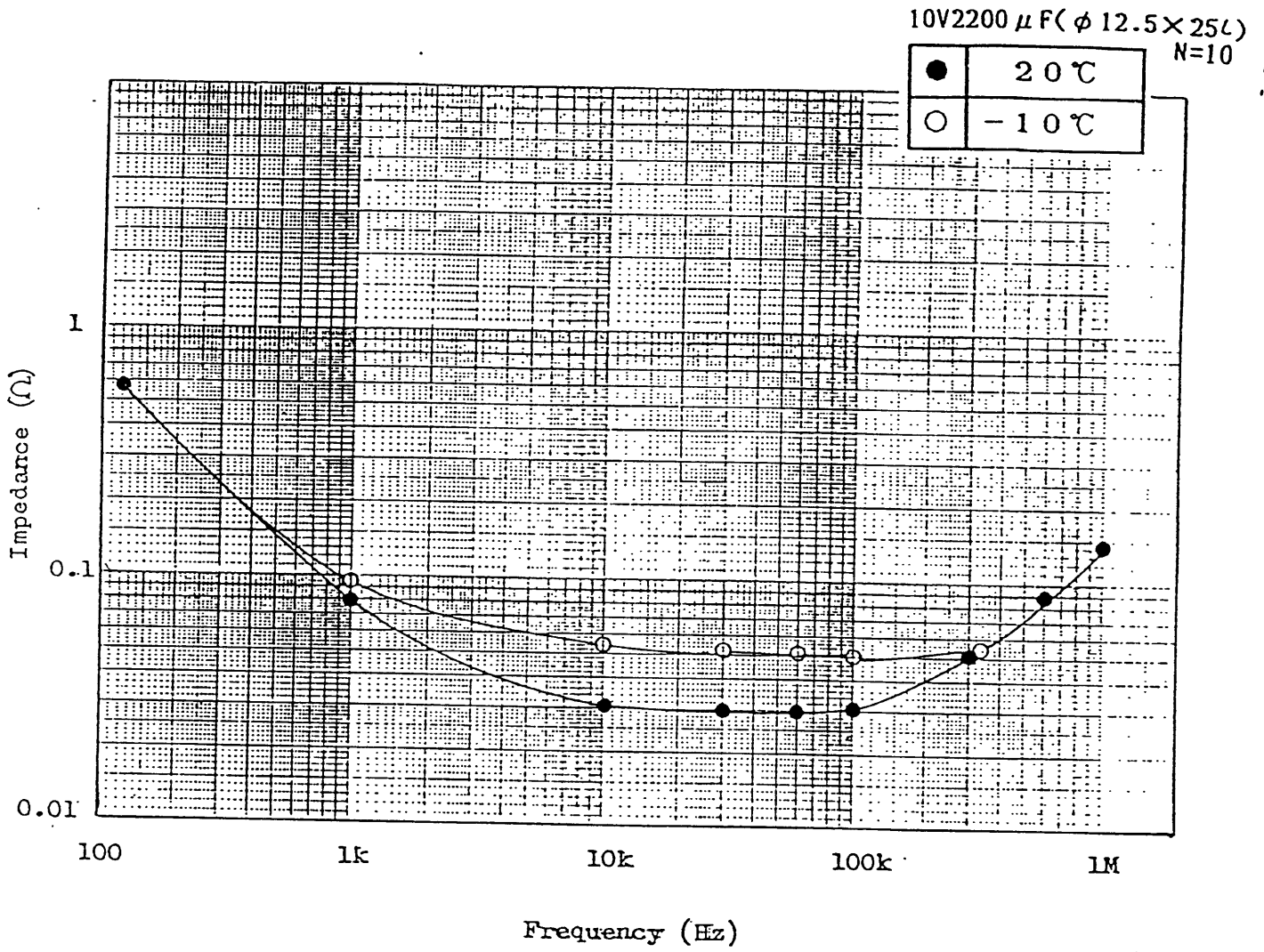
Cleaning condition : Fronsolve AES(Freon TES)

supersonic wave applied 15 minutes.

4. Performance of developed capacitors "RSH series"

- Frequency characteristic( 20°C.-10°C)
- Ripple current vs. Ripple rise temperature
- Ripple life test at 105 °C
- Life test at 110°C,115°C

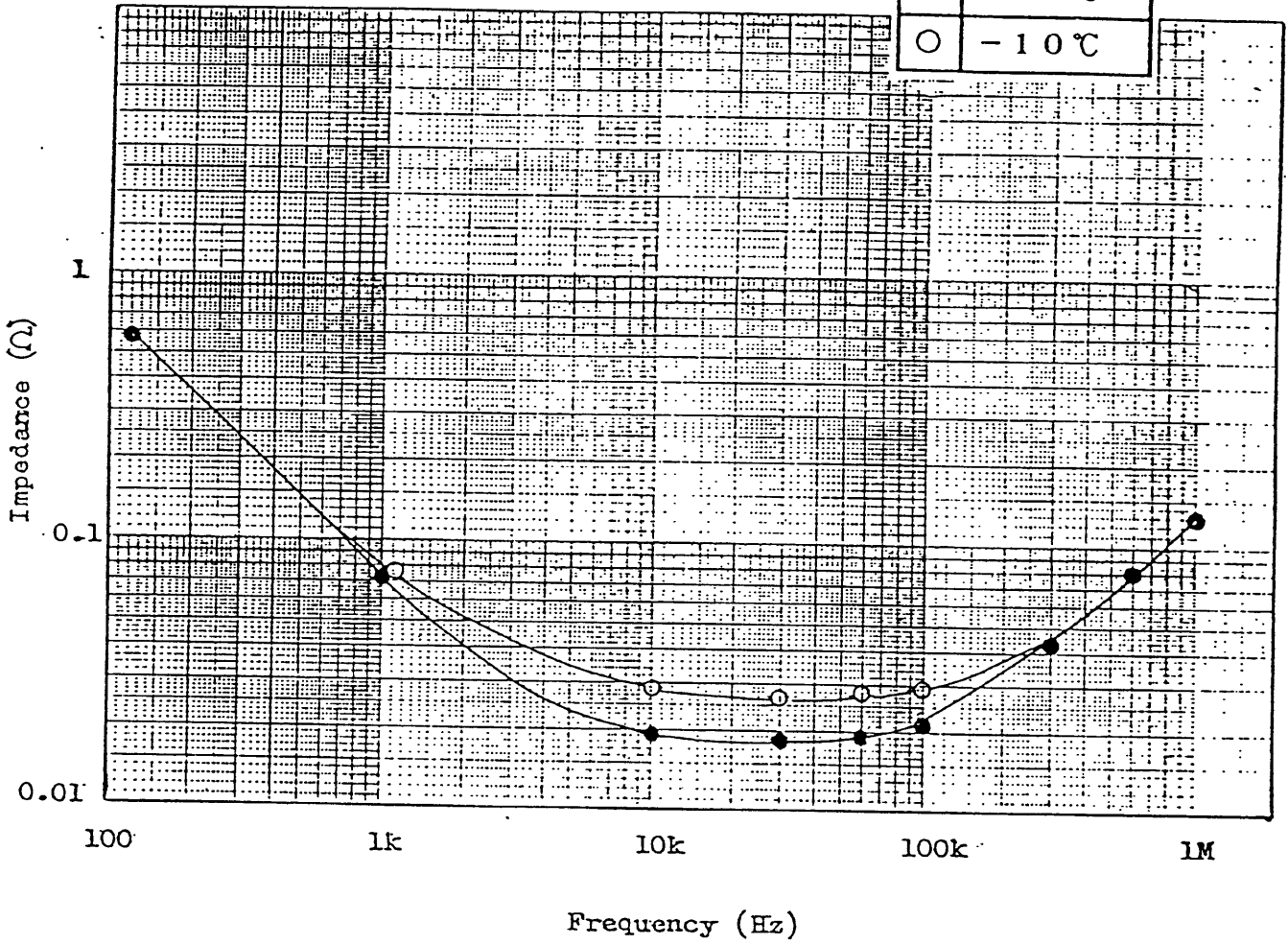
● Frequency characteristic



● Frequency characteristic

25V2200  $\mu$ F ( $\phi$  12.5  $\times$  40L)  
N=10

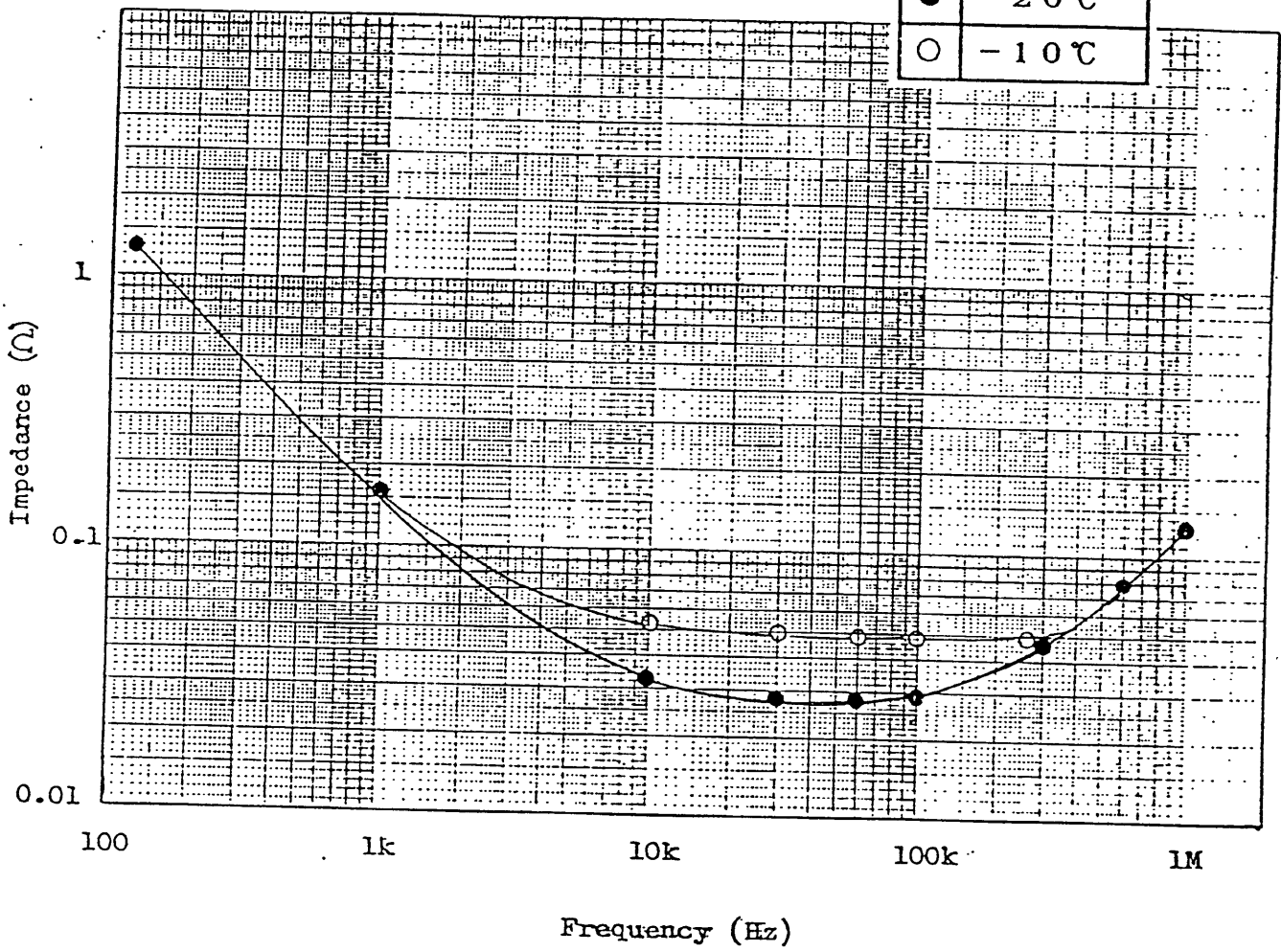
●	20 $^{\circ}$ C
○	-10 $^{\circ}$ C



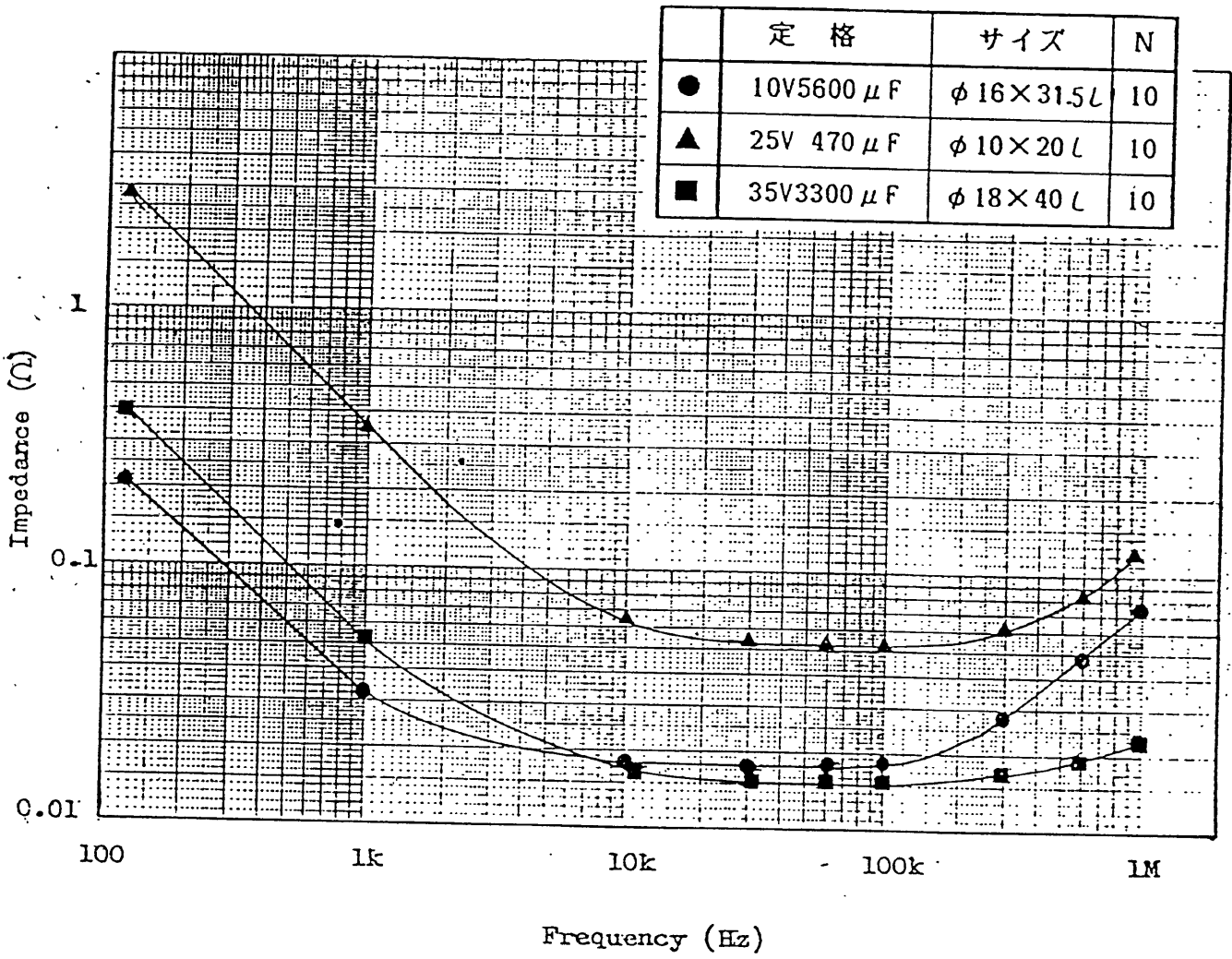
● Frequency characteristic

50V1000  $\mu$ F ( $\phi$  16  $\times$  31.5)  
N=10

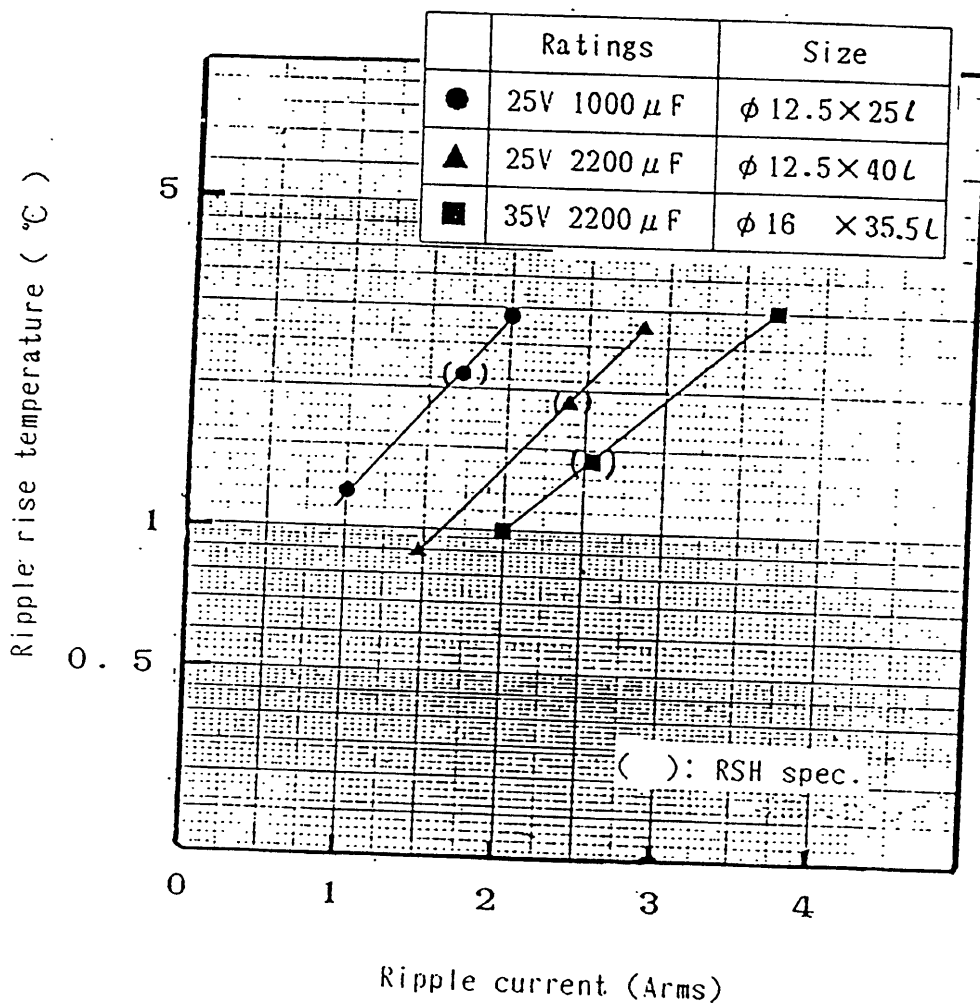
●	20 $^{\circ}$ C
○	-10 $^{\circ}$ C



● Frequency characteristic

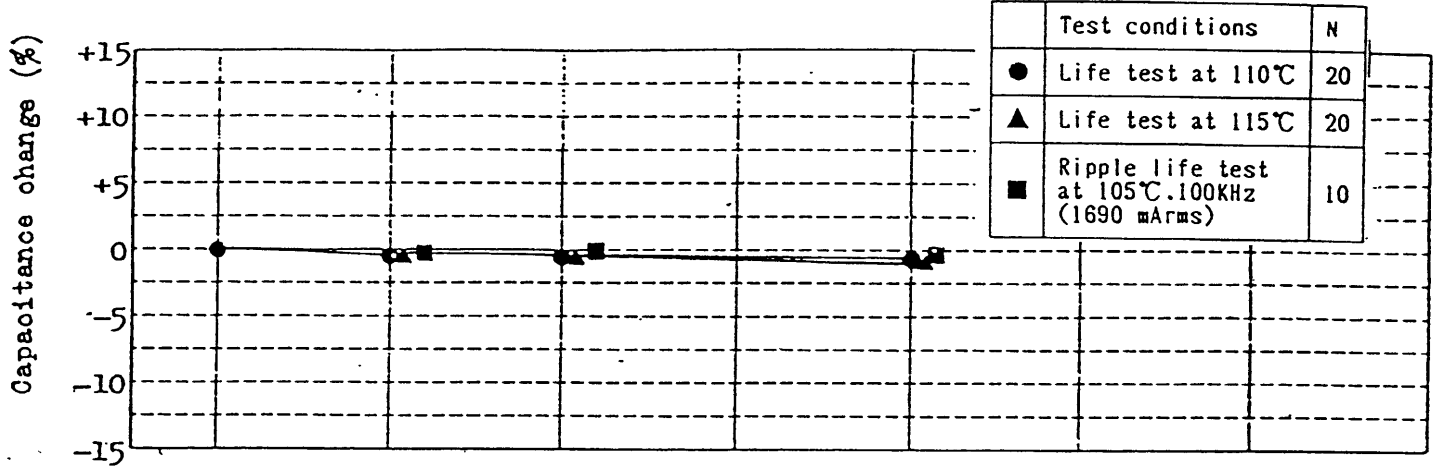


● Ripple current vs. Ripple rise temperature

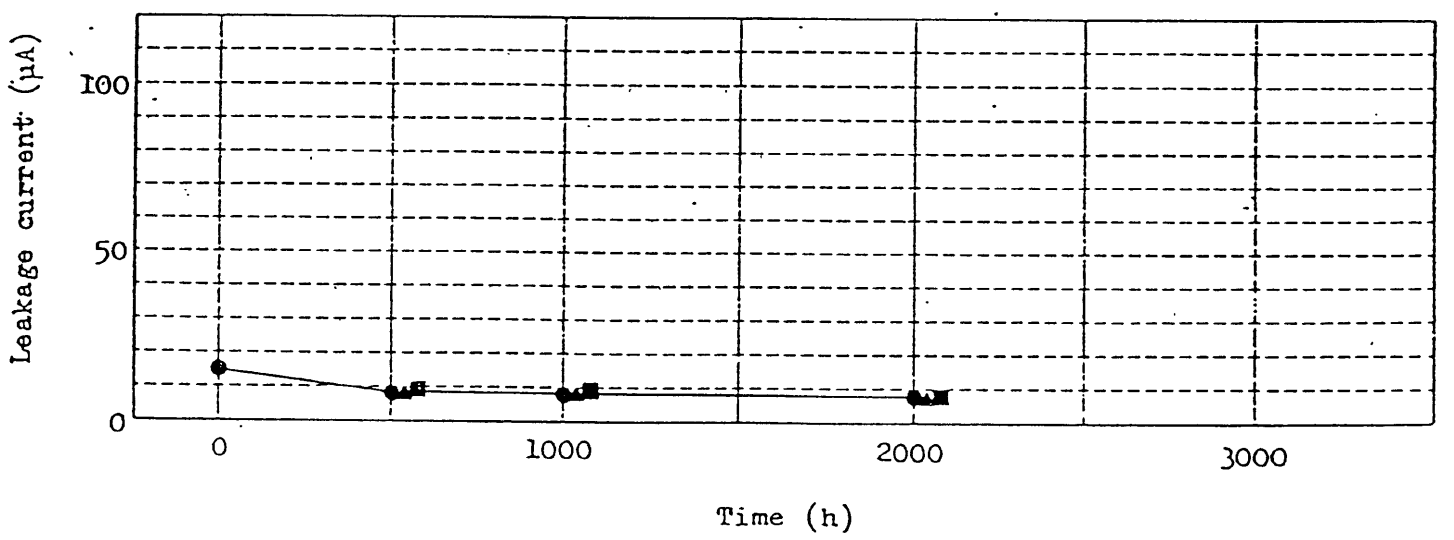
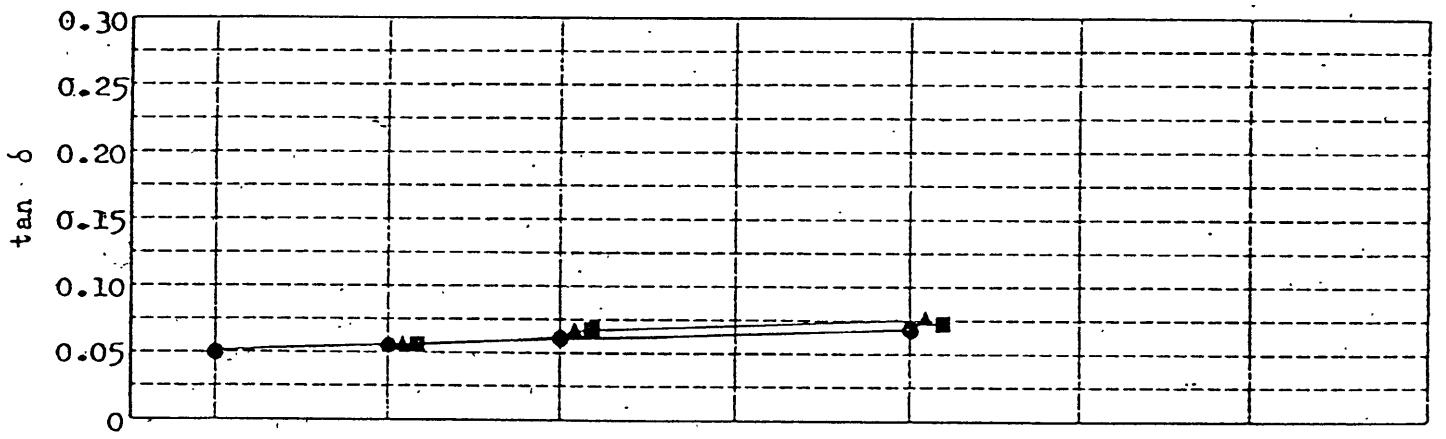


● Ripple life test and Life test

25V 1000  $\mu$ F (  $\phi$  12.5 $\times$ 25L)



Test conditions		N
●	Life test at 110°C	20
▲	Life test at 115°C	20
■	Ripple life test at 105°C, 100KHz (1690 mArms)	10

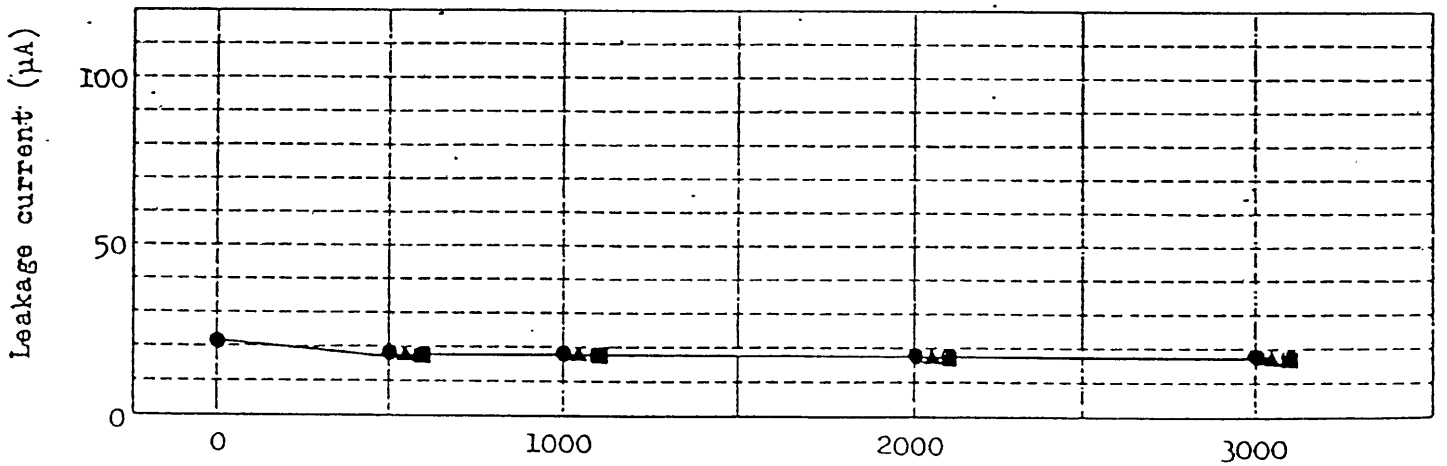
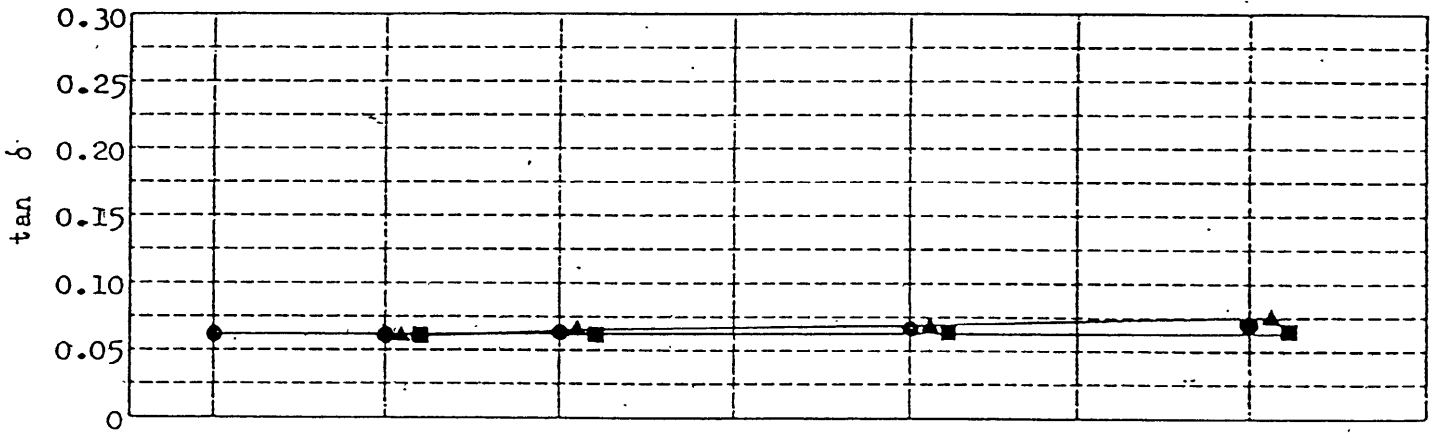
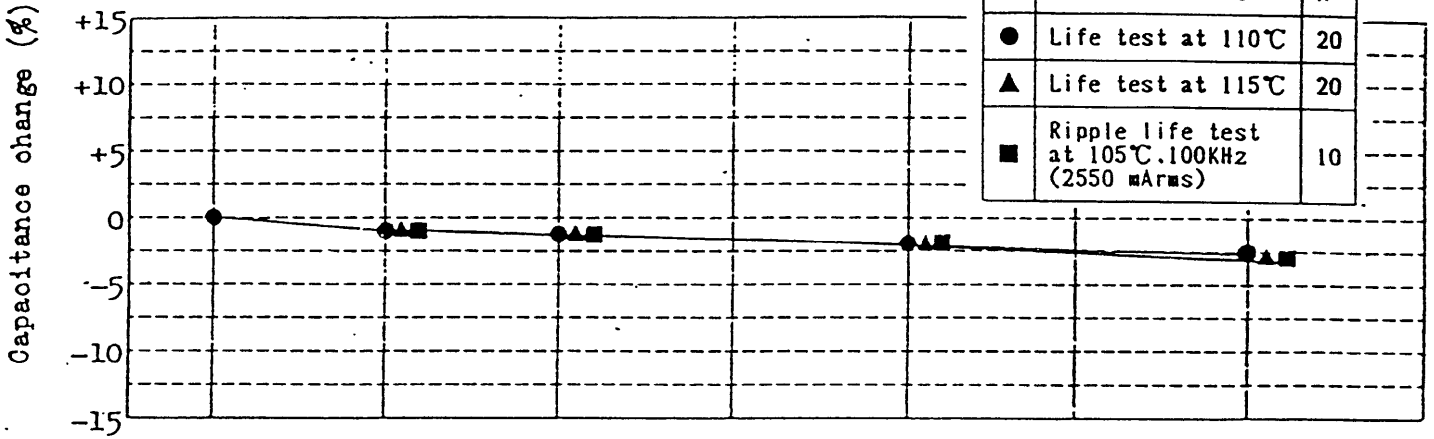




● Ripple life test and Life test

35V 2200  $\mu$ F (  $\phi$  16 $\times$ 35.5 L )

Test conditions		N
●	Life test at 110 $^{\circ}$ C	20
▲	Life test at 115 $^{\circ}$ C	20
■	Ripple life test at 105 $^{\circ}$ C, 100KHz (2550 $\mu$ Arms)	10

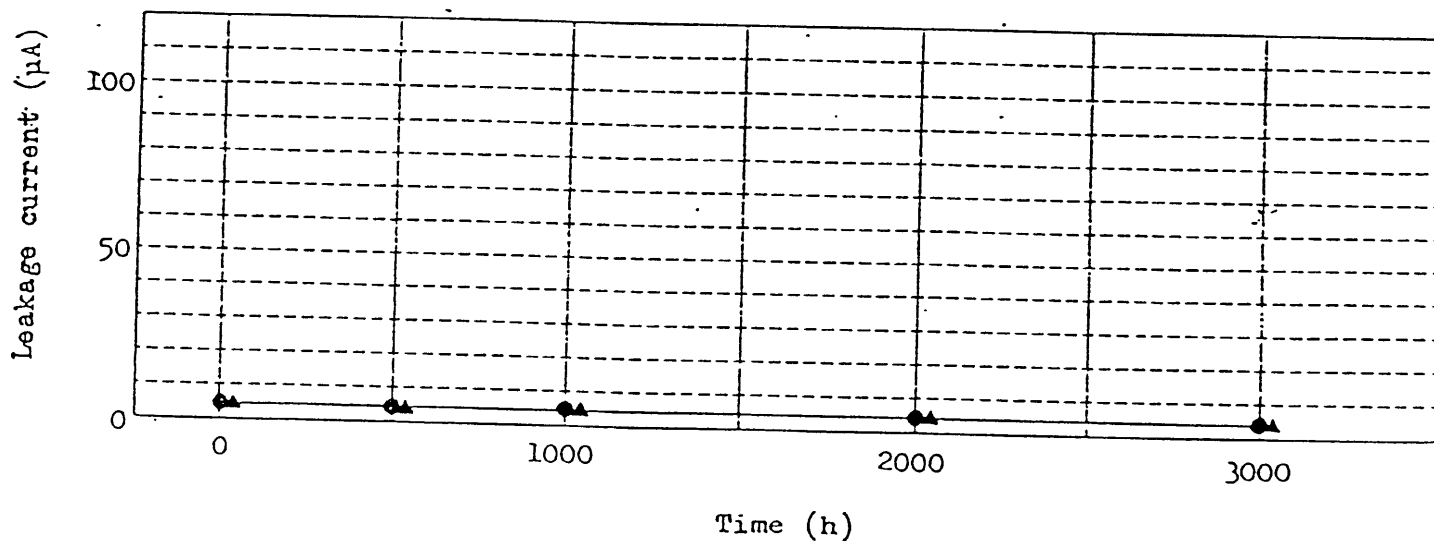
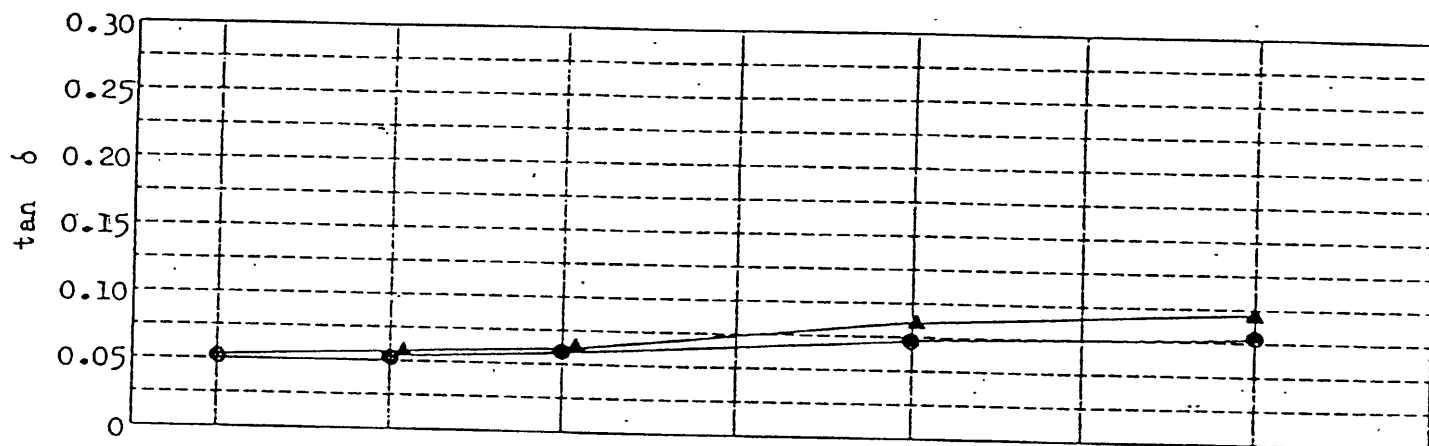
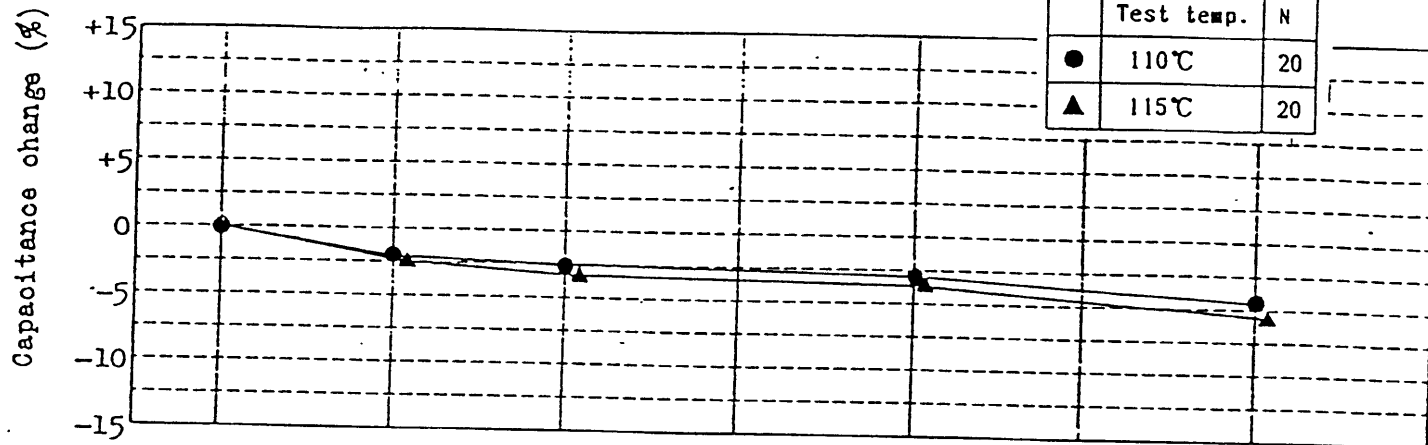


Time (h)

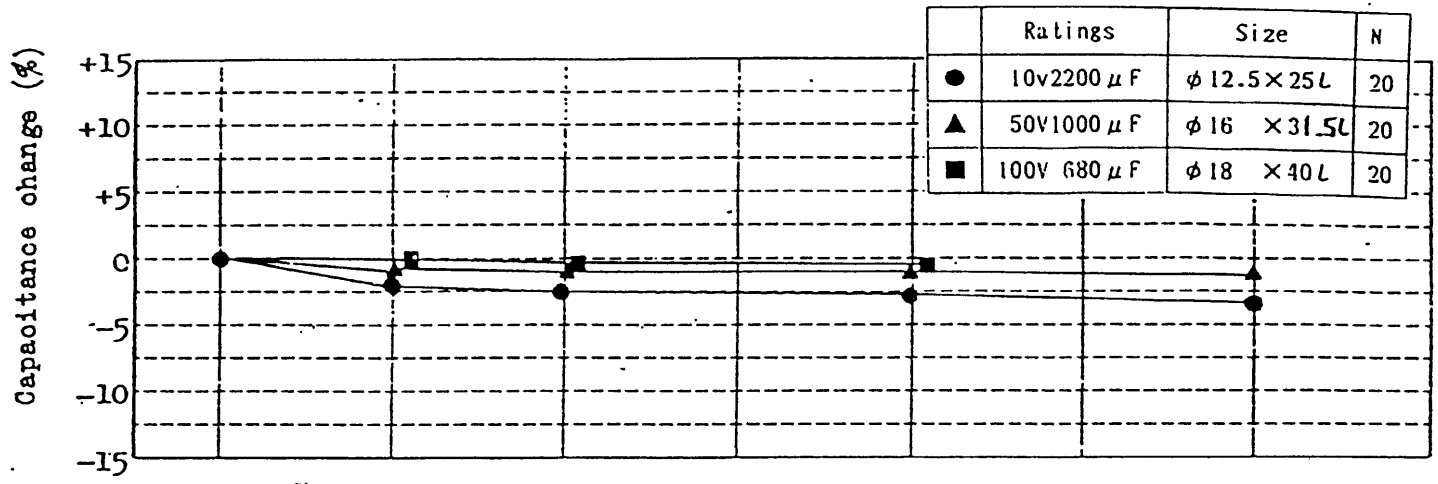
● Life test at 110°C

10V 560  $\mu$ F (  $\phi$ 10 $\times$ 16L )

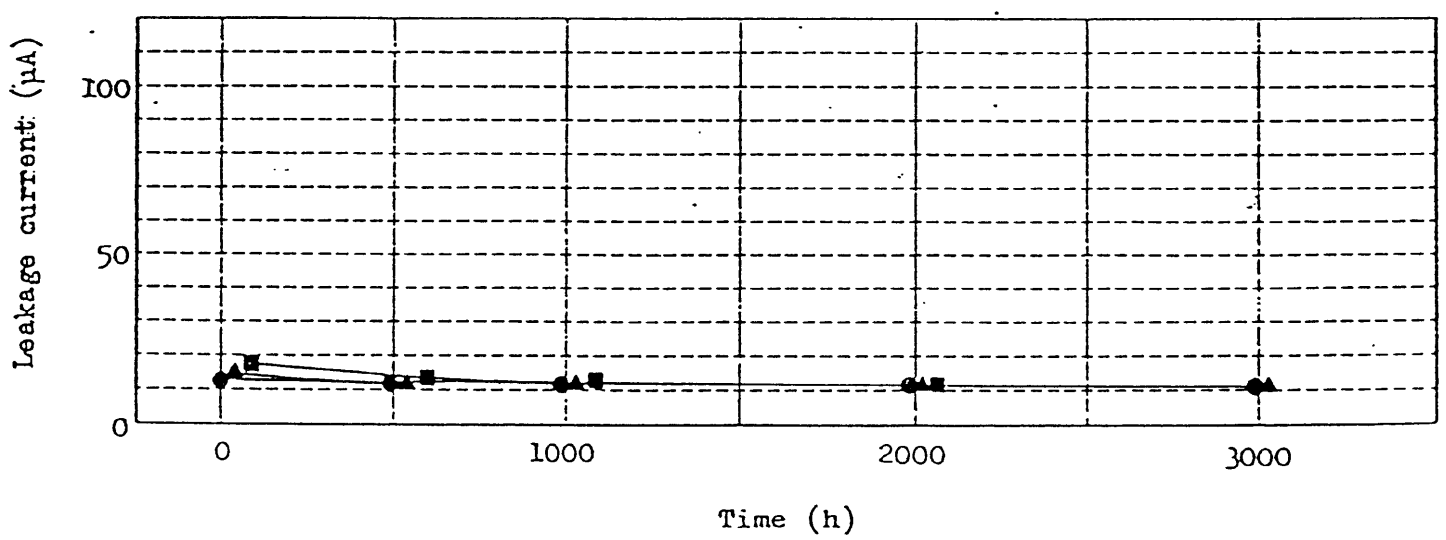
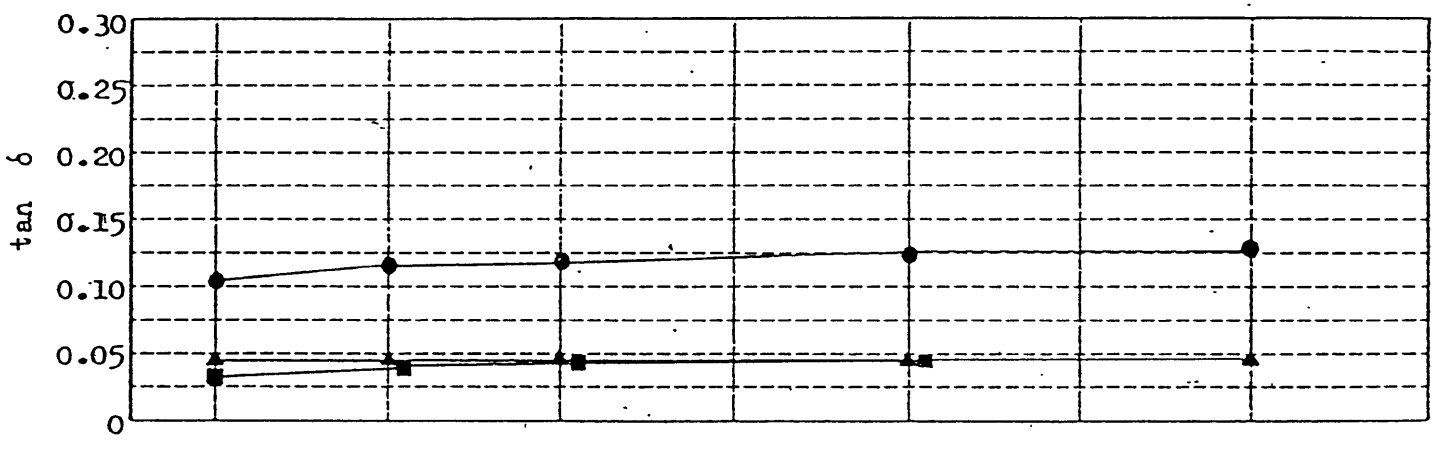
	Test temp.	N
●	110°C	20
▲	115°C	20



● Life test



	Ratings	Size	N
●	10V 2200 $\mu F$	$\phi 12.5 \times 25L$	20
▲	50V 1000 $\mu F$	$\phi 16 \times 31.5L$	20
■	100V 680 $\mu F$	$\phi 18 \times 40L$	20



P a r t N o .	R. V. V. DC	S. V. V. DC	Cap. μF	L. C. μA	TANδ	Impedance (Ω) 100kHz		Ripple current (mA rms) 105°C 100kHz	Case size (mm)		
						20°C	-10°C		D	L	F
	100	125	5.6	7.6	0.07	1.9	7.6	57	5	11.5	2.0
	100	125	8.2	10	0.07	1.3	5.2	74	5	15	2.0
	100	125	12	14	0.07	1.1	4.4	78	6.3	11.5	2.5
	100	125	18	20	0.07	0.62	2.5	85	6.3	15	2.5
	100	125	22	24	0.07	0.53	2.1	275	8	12	3.5
	100	125	33	35	0.07	0.35	1.4	360	8	15	3.5
	100	125	39	41	0.07	0.27	1.1	490	8	20	3.5
	100	125	27	29	0.07	0.47	1.9	319	10	12.5	5.0
	100	125	33	35	0.07	0.32	1.3	424	10	16	5.0
	100	125	56	58	0.07	0.25	1.0	499	10	20	5.0
	100	125	68	70	0.07	0.18	0.72	634	10	25	5.0
	100	125	100	102	0.07	0.15	0.60	739	10	30	5.0
	100	125	68	70	0.07	0.20	0.80	613	12.5	15	5.0
	100	125	100	102	0.07	0.13	0.52	805	12.5	20	5.0
	100	125	120	122	0.07	0.11	0.44	857	12.5	25	5.0
	100	125	180	182	0.07	0.090	0.36	1120	12.5	30	5.0
	100	125	220	222	0.07	0.075	0.30	1240	12.5	35	5.0
	100	125	270	272	0.07	0.060	0.24	1330	12.5	40	5.0
	100	125	120	122	0.07	0.13	0.52	706	16	15	7.5
	100	125	180	182	0.07	0.11	0.44	916	16	20	7.5
	100	125	220	222	0.07	0.081	0.32	1290	16	25	7.5
	100	125	330	332	0.07	0.059	0.23	1630	16	31.5	7.5
	100	125	390	392	0.07	0.052	0.21	1750	16	35.5	7.5
	100	125	470	472	0.07	0.045	0.18	1920	16	40	7.5
	100	125	150	152	0.07	0.12	0.46	871	18	15	7.5
	100	125	270	272	0.07	0.085	0.34	1170	18	20	7.5
	100	125	330	332	0.07	0.071	0.28	1500	18	25	7.5
	100	125	390	392	0.07	0.058	0.23	1630	18	31.5	7.5
	100	125	560	562	0.07	0.054	0.22	1920	18	35.5	7.5
	100	125	680	682	0.07	0.041	0.16	2100	18	40	7.5

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Part No.	R. V. V. DC	S. V. V. DC	Cap. μF	L. C. μA	TAN δ	Impedance (Ω)		Ripple current (mA rms) 105°C 100kHz	Case size (mm)		
						20°C	100kHz -10°C		D	L	F
	63	79	12	9.5	0.08	1.2	3.6	120	5	11.5	2.0
	63	79	18	13	0.08	0.85	2.6	135	5	15	2.0
	63	79	27	19	0.08	0.55	1.7	148	6.3	11.5	2.5
	63	79	39	25	0.08	0.33	1.1	153	6.3	15	2.5
	63	79	47	31	0.08	0.32	0.96	360	8	12	3.5
	63	79	68	41	0.08	0.21	0.72	169	8	15	3.5
	63	79	82	53	0.08	0.17	0.51	682	8	20	3.5
	63	79	96	37	0.08	0.23	0.69	448	10	12.5	5.0
	63	79	68	44	0.08	0.17	0.51	553	10	16	5.0
	63	79	120	77	0.08	0.12	0.36	676	10	20	5.0
	63	79	150	96	0.08	0.10	0.30	876	10	25	5.0
	63	79	130	115	0.08	0.085	0.26	1020	10	30	5.0
	63	79	150	96	0.08	0.11	0.33	745	12.5	15	5.0
	63	79	220	140	0.08	0.075	0.23	979	12.5	20	5.0
	63	79	270	172	0.08	0.065	0.20	1180	12.5	25	5.0
	63	79	390	247	0.08	0.055	0.17	1310	12.5	30	5.0
	63	79	470	298	0.08	0.048	0.14	1470	12.5	35	5.0
	63	79	560	354	0.08	0.042	0.13	1590	12.5	40	5.0
	63	79	220	140	0.08	0.080	0.24	982	16	15	7.5
	63	79	390	247	0.08	0.057	0.17	1210	16	20	7.5
	63	79	470	298	0.08	0.052	0.16	1490	16	25	7.5
	63	79	580	430	0.08	0.042	0.13	1890	16	31.5	7.5
	63	79	820	518	0.08	0.036	0.11	2140	16	35.5	7.5
	63	79	1000	632	0.08	0.032	0.096	2410	16	40	7.5
	63	79	330	209	0.08	0.055	0.20	1200	18	15	7.5
	63	79	470	298	0.08	0.058	0.17	1460	18	20	7.5
	63	79	530	430	0.08	0.050	0.15	1710	19	25	7.5
	63	79	630	518	0.08	0.042	0.13	1900	18	31.5	7.5
	63	79	1000	632	0.08	0.035	0.11	2340	18	35.5	7.5
	63	79	1200	758	0.08	0.032	0.096	2560	18	40	7.5

Part No.	R. V. V. DC	S. V. V. DC	Cap. μF	L. C. μA	T.A.M.S	Impedance (Ω)		Ripple current (mA rms) 105°C 100kHz	Case size (mm)		
						20°C	100kHz		D	L	F
	50	63	0.17	2.2	0.10	3.9	7.8	22	5	11.5	2.0
	50	63	1	2.5	0.10	3.5	7.0	36	5	11.5	2.0
	50	63	2.2	3.1	0.10	3.0	6.0	54	5	11.5	2.0
	50	63	3.3	3.6	0.10	2.6	5.2	63	5	11.5	2.0
	50	63	4.7	4.3	0.10	2.2	4.4	75	5	11.5	2.0
	50	63	10	7.0	0.10	1.4	2.8	110	5	11.5	2.0
	50	63	18	11	0.10	0.95	1.9	120	5	11.5	2.0
	50	63	27	15	0.10	0.55	1.1	135	5	15	2.0
	50	63	33	21	0.10	0.36	0.72	148	6.3	11.5	2.5
	50	63	56	30	0.10	0.28	0.56	153	6.3	15	2.5
	50	63	68	36	0.10	0.20	0.40	360	8	12	3.5
	50	63	82	43	0.10	0.18	0.36	460	8	15	3.5
	50	63	120	62	0.10	0.13	0.26	670	8	20	3.5
	50	63	33	43	0.10	0.13	0.35	443	10	12.5	5.0
	50	63	100	52	0.10	0.15	0.30	553	10	16	5.0
	50	63	130	32	0.10	0.085	0.17	676	10	20	5.0
	50	63	220	112	0.10	0.075	0.15	876	10	25	5.0
	50	63	330	167	0.10	0.055	0.11	1010	10	30	5.0
	50	63	180	92	0.10	0.095	0.19	745	12.5	15	5.0
	50	63	330	167	0.10	0.060	0.12	979	12.5	20	5.0
	50	63	470	237	0.10	0.041	0.088	1180	12.5	25	5.0
	50	63	550	282	0.10	0.040	0.080	1310	12.5	30	5.0
	50	63	680	342	0.10	0.035	0.072	1470	12.5	35	5.0
	50	63	520	412	0.10	0.034	0.058	1590	12.5	40	5.0
	50	63	330	167	0.10	0.055	0.13	982	16	15	7.5
	50	63	680	342	0.10	0.045	0.090	1210	16	20	7.5
	50	63	820	412	0.10	0.038	0.075	1490	16	25	7.5
	50	63	1000	502	0.10	0.032	0.064	1890	16	31.5	7.5
	50	63	1200	602	0.10	0.028	0.056	2140	16	35.5	7.5
	50	63	1500	752	0.10	0.026	0.052	2410	16	40	7.5
	50	63	470	237	0.10	0.048	0.096	1080	18	15	7.5
	50	63	820	412	0.10	0.035	0.072	1450	18	20	7.5
	50	63	1000	502	0.10	0.030	0.060	1720	18	25	7.5

Part No.	R. V. V. DC	S. V. V. DC	Cap. μF	L. C. μA	TANδ	Impedance (Ω)		Ripple current (mA rms) 105°C 100kHz	Case size (mm)		
						20°C	100kHz -10°C		D	L	F
	50	63	1500	752	0.10	0.026	0.052	1970	18	31.5	7.5
	50	63	1800	902	0.10	0.025	0.050	2310	18	35.5	7.5
	50	63	2200	1102	0.12	0.024	0.048	2530	18	40	7.5

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Part No.	R. V. V. DC	S. V. V. DC	Cap. $\mu$ F	L. C. $\mu$ A	TAN $\delta$	Impedance ( $\Omega$ )		Ripple current (mA rms) 105°C 100kHz	Case size (mm)		
						20°C	100Hz -10°C		D	L	F
35	44	27	11	0.12	0.65	1.3	175	5	11.5	2.0	
35	44	39	15	0.12	0.46	0.92	235	5	15	2.0	
35	44	56	21	0.12	0.30	0.60	290	6.3	11.5	2.5	
35	44	82	30	0.12	0.20	0.40	400	6.3	15	2.5	
35	44	120	44	0.12	0.17	0.34	505	8	12	3.5	
35	44	150	65	0.12	0.12	0.26	637	8	15	3.5	
35	44	220	73	0.12	0.095	0.19	760	8	20	3.5	
35	44	150	54	0.12	0.12	0.24	635	10	12.5	5.0	
35	44	130	65	0.12	0.095	0.19	735	10	16	5.0	
35	44	330	117	0.12	0.065	0.13	1010	10	20	5.0	
35	44	330	138	0.12	0.055	0.11	1190	10	25	5.0	
35	44	560	198	0.12	0.045	0.090	1450	10	30	5.0	
35	44	330	117	0.12	0.065	0.13	1010	12.5	15	5.0	
35	44	560	198	0.12	0.045	0.084	1400	12.5	20	5.0	
35	44	680	240	0.12	0.038	0.076	1690	12.5	25	5.0	
35	44	1000	352	0.12	0.032	0.064	1950	12.5	30	5.0	
35	44	1200	422	0.12	0.028	0.056	2200	12.5	35	5.0	
35	44	1500	527	0.12	0.025	0.052	2390	12.5	40	5.0	
35	44	560	198	0.12	0.046	0.092	1360	16	15	7.5	
35	44	1000	352	0.12	0.034	0.068	1730	16	20	7.5	
35	44	1200	422	0.12	0.029	0.056	2070	16	25	7.5	
35	44	1800	632	0.12	0.025	0.050	2350	16	31.5	7.5	
35	44	2200	772	0.14	0.022	0.044	2550	16	35.5	7.5	
35	44	2700	947	0.14	0.020	0.040	2900	16	40	7.5	
35	44	680	240	0.12	0.043	0.086	1520	18	15	7.5	
35	44	1200	422	0.12	0.036	0.072	1900	18	20	7.5	
35	44	1800	632	0.12	0.027	0.054	2200	18	25	7.5	
35	44	2200	772	0.14	0.023	0.046	2490	19	31.5	7.5	
35	44	2700	947	0.14	0.019	0.038	2770	18	35.5	7.5	
35	44	3300	1157	0.16	0.018	0.036	3110	18	40	7.5	

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Part No.	V. DC	V. DC	Capacitance uF	L. C. uA	TAN δ	Temperature		Ripple current (mA rms) 105°C 100kHz	Case size (mm)		
						20°C	100°C		D	L	F
16	20	20	55	10	0.15	0.55	1.5	175	5	11.5	2.0
16	20	20	82	15	0.16	0.46	0.92	235	5	15	2.0
16	20	20	120	21	0.16	0.31	0.62	290	6.3	11.5	2.5
16	20	20	180	30	0.16	0.20	0.40	400	6.3	15	2.5
16	20	20	270	45	0.16	0.17	0.34	501	8	12	3.5
16	20	20	330	54	0.16	0.13	0.26	575	8	15	3.5
16	20	20	470	77	0.16	0.095	0.19	760	8	20	3.5
16	20	20	330	54	0.16	0.13	0.26	625	10	12.5	5.0
16	20	20	390	64	0.16	0.090	0.18	795	10	16	5.0
16	20	20	680	110	0.16	0.065	0.13	1010	10	20	5.0
16	20	20	820	133	0.16	0.055	0.11	1190	10	25	5.0
16	20	20	1200	194	0.16	0.047	0.094	1430	10	30	5.0
16	20	20	680	110	0.16	0.065	0.13	1010	12.5	15	5.0
16	20	20	1200	194	0.16	0.042	0.084	1400	12.5	20	5.0
16	20	20	1500	242	0.16	0.038	0.076	1690	12.5	25	5.0
16	20	20	2200	354	0.16	0.032	0.064	1950	12.5	30	5.0
16	20	20	2700	434	0.16	0.028	0.056	2200	12.5	35	5.0
16	20	20	3300	530	0.20	0.026	0.052	2390	12.5	40	5.0
16	20	20	1500	242	0.16	0.046	0.092	1840	16	15	7.5
16	20	20	2200	354	0.16	0.034	0.068	1730	16	20	7.5
16	20	20	2700	434	0.16	0.028	0.056	2070	16	25	7.5
16	20	20	3300	530	0.20	0.025	0.050	2350	16	31.5	7.5
16	20	20	4700	754	0.22	0.022	0.044	2550	16	35.5	7.5
16	20	20	5600	898	0.24	0.020	0.040	2900	16	40	7.5
16	20	20	1500	242	0.16	0.043	0.085	1490	18	15	7.5
16	20	20	2700	434	0.18	0.030	0.060	1870	18	20	7.5
16	20	20	3900	626	0.20	0.027	0.054	2160	18	25	7.5
16	20	20	4700	754	0.22	0.023	0.046	2450	18	31.5	7.5
16	20	20	6800	1090	0.26	0.019	0.038	2730	18	35.5	7.5
16	20	20	8200	1314	0.30	0.018	0.036	3060	18	40	7.5

Part No.	R. V. V. DC	S. V. V. DC	Cap. uF	L. C. uA	TANδ	Impedance (Ω)		Ripple current (pA rms) 105°C 100kHz	Case size (mm)		
						20°C	-10°C		D	L	F
25	32	39	11	0.14	0.65	1.3	175	5.	11.5	2.0	
25	32	56	16	0.14	0.46	0.92	235	5	15	2.0	
25	32	82	22	0.14	0.31	0.62	290	6.3	11.5	2.5	
25	32	120	32	0.14	0.20	0.40	400	6.3	15	2.5	
25	32	180	47	0.14	0.17	0.24	503	8	12	3.5	
25	32	220	57	0.14	0.13	0.26	575	8	15	3.5	
25	32	330	84	0.14	0.095	0.19	751	8	20	3.5	
25	32	220	57	0.14	0.12	0.24	629	10	12.5	5.0	
25	32	270	69	0.14	0.090	0.19	795	10	16	5.0	
25	32	470	119	0.14	0.065	0.13	1010	10	20	5.0	
25	32	560	142	0.14	0.055	0.11	1130	10	25	5.0	
25	32	820	207	0.14	0.045	0.090	1440	10	30	5.0	
25	32	470	119	0.14	0.065	0.13	1010	12.5	15	5.0	
25	32	820	207	0.14	0.042	0.084	1400	12.5	20	5.0	
25	32	1000	252	0.14	0.036	0.072	1690	12.5	25	5.0	
25	32	1500	377	0.14	0.030	0.060	1950	12.5	30	5.0	
25	32	1800	452	0.14	0.028	0.056	2200	12.5	35	5.0	
25	32	2200	552	0.16	0.024	0.048	2390	12.5	40	5.0	
25	32	820	207	0.14	0.046	0.092	1360	16	15	7.5	
25	32	1500	377	0.14	0.034	0.068	1730	16	20	7.5	
25	32	1800	452	0.14	0.028	0.056	2070	16	25	7.5	
25	32	2700	677	0.16	0.025	0.050	2350	16	31.5	7.5	
25	32	3000	827	0.18	0.022	0.044	2550	16	35.5	7.5	
25	32	3900	977	0.18	0.020	0.040	2900	16	40	7.5	
25	32	1200	302	0.14	0.043	0.086	1500	18	15	7.5	
25	32	1800	452	0.14	0.036	0.072	1890	18	20	7.5	
25	32	2700	677	0.16	0.027	0.054	2180	18	25	7.5	
25	32	3000	827	0.18	0.023	0.046	2470	18	31.5	7.5	
25	32	3900	977	0.18	0.019	0.038	2740	18	35.5	7.5	
25	32	4700	1177	0.20	0.018	0.036	3070	18	40	7.5	

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Part No.	R. V. V. DC	S. V. V. DC	Cap. µF	L. C. µA	TAN δ	Impedance (Ω)		Pulse current (mA rms) 105°C 100Hz	Case size (mm)		
						20°C	-10°C		D	L	F
	6.3	8	100	8.3	0.22	0.65	1.3	175	5	11.5	2.0
	6.3	8	150	11	0.22	0.46	0.92	235	5	15	2.0
	6.3	8	220	15	0.22	0.30	0.60	230*	6.3	11.5	2.5
	6.3	6	330	22	0.22	0.20	0.40	400	6.3	15	2.5
	6.3	8	470	31	0.22	0.17	0.34	488	8	12	3.5
	6.3	8	680	44	0.22	0.13	0.26	617	8	15	3.5
	6.3	8	1000	55	0.22	0.095	0.19	800	8	20	3.5
	6.3	6	650	44	0.22	0.12	0.24	613	10	12.5	5.0
	6.3	6	820	53	0.22	0.095	0.19	754	10	16	5.0
	6.3	8	1250	77	0.22	0.065	0.13	1010	10	20	5.0
	6.3	8	1500	95	0.22	0.055	0.11	1120	10	25	5.0
	6.3	8	2200	140	0.24	0.045	0.090	1440	10	30	5.0
	6.3	8	3300	77	0.22	0.065	0.13	1010	12.5	15	5.0
	6.3	8	4700	140	0.24	0.042	0.084	1400	12.5	20	5.0
	6.3	8	6800	172	0.24	0.038	0.076	1630	12.5	25	5.0
	6.3	8	10000	247	0.26	0.032	0.064	1950	12.5	30	5.0
	6.3	8	15000	296	0.28	0.028	0.056	2220	12.5	35	5.0
	6.3	8	22000	394	0.30	0.026	0.052	2390	12.5	40	5.0
	6.3	8	33000	172	0.24	0.046	0.092	1910	16	15	7.5
	6.3	8	47000	298	0.28	0.034	0.068	1660	16	20	7.5
	6.3	8	68000	354	0.30	0.028	0.056	2070	16	25	7.5
	6.3	8	100000	430	0.32	0.025	0.050	2350	16	31.5	7.5
	6.3	8	150000	518	0.36	0.022	0.044	2550	16	35.5	7.5
	6.3	8	220000	758	0.44	0.020	0.040	2970	16	40	7.5
	6.3	8	330000	209	0.26	0.043	0.086	1460	18	15	7.5
	6.3	8	470000	354	0.30	0.030	0.060	1850	18	20	7.5
	6.3	8	680000	430	0.32	0.027	0.054	2120	18	25	7.5
	6.3	8	1000000	632	0.40	0.023	0.046	2410	18	31.5	7.5
	6.3	8	1500000	758	0.44	0.019	0.038	2680	16	35.5	7.5
	6.3	8	2200000	947	0.50	0.018	0.036	3010	16	40	7.5

P a r t N o .	R. V. V. DC	S. V. V. DC	Cap. µF	L. C. µA	TAN δ	Impedance (Ω)		R <sub>100</sub> current (µA rms) 105°C 100Hz	Case size (mm)		
						20°C	-10°C		D	L	F
	10	13	82	10	0.19	0.65	1.3	175	5	11.5	2.0
	10	13	100	12	0.19	0.46	0.92	235	5	15	2.0
	10	13	180	20	0.19	0.31	0.62	290	6	11.5	2.5
	10	13	220	24	0.19	0.20	0.40	400	5	3	2.5
	10	13	330	35	0.19	0.17	0.34	490	8	12	3.5
	10	13	470	49	0.19	0.13	0.26	617	8	15	3.5
	10	13	590	70	0.19	0.095	0.19	800	9	20	3.5
	10	13	470	49	0.19	0.13	0.24	620	10	13.5	5.0
	10	13	560	58	0.19	0.095	0.19	734	10	17	5.0
	10	13	1000	107	0.19	0.060	0.12	1010	10	20	5.0
	10	13	1200	122	0.19	0.055	0.11	1130	10	25	5.0
	10	13	1500	152	0.19	0.045	0.090	1440	10	30	5.0
	10	13	1000	102	0.19	0.065	0.13	1010	13.5	15	5.0
	10	13	1800	182	0.19	0.042	0.084	1400	12.5	20	5.0
	10	13	2200	222	0.21	0.036	0.072	1690	12.5	25	5.0
	10	13	2700	272	0.21	0.032	0.064	1950	12.5	30	5.0
	10	13	3300	322	0.23	0.028	0.056	2220	12.5	35	5.0
	10	13	3900	392	0.23	0.025	0.050	2290	12.5	40	5.0
	10	13	1800	182	0.19	0.046	0.092	1310	16	15	7.5
	10	13	3300	332	0.23	0.034	0.068	1660	16	20	7.5
	10	13	3900	392	0.23	0.028	0.056	2070	16	25	7.5
	10	13	5600	562	0.27	0.025	0.050	2350	16	31.5	7.5
	10	13	6800	682	0.29	0.022	0.044	2550	16	35.5	7.5
	10	13	8200	822	0.31	0.020	0.040	2970	16	40	7.5
	10	13	2200	222	0.21	0.043	0.086	1450	18	15	7.5
	10	13	3900	392	0.23	0.030	0.060	1650	18	20	7.5
	10	13	4700	472	0.25	0.027	0.054	2120	16	35	7.5
	10	13	6100	612	0.29	0.026	0.046	2410	16	31.5	7.5
	10	13	8200	822	0.32	0.019	0.038	2680	16	38.5	7.5
	10	13	10000	1002	0.37	0.016	0.032	3010	16	40	7.5

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Table 1  
Standard ratings

Part No.	R. V. V. DC	S. V. V. DC	Cap. μF	L. C. μA	TAN δ	Impedance (Ω)		Ripple current (mA rms) 105°C 100Hz	Case size (mm)		
						20°C	-10°C		D	L	F
	6.3	8	100	8.3	0.22	0.65	1.3	175	5	11.5	2.0
	6.3	8	150	11	0.22	0.46	0.92	235	5	15	2.0
	6.3	8	220	15	0.22	0.30	0.60	290	6.3	11.5	2.5
	6.3	8	330	22	0.22	0.20	0.40	400	6.3	15	2.5
	6.3	8	470	31	0.22	0.17	0.34	488	8	12	3.5
	6.3	8	680	44	0.22	0.13	0.26	617	8	15	3.5
	6.3	8	1000	55	0.22	0.095	0.19	800	8	20	3.5
	6.3	8	650	44	0.22	0.12	0.24	613	10	12.5	5.0
	6.3	8	820	53	0.22	0.095	0.19	754	10	15	5.0
	6.3	8	1200	77	0.22	0.065	0.13	1010	10	20	5.0
	6.3	8	1500	95	0.22	0.055	0.11	1150	10	25	5.0
	6.3	8	2200	140	0.24	0.045	0.090	1440	10	30	5.0
	6.3	8	3300	77	0.22	0.065	0.13	1010	10	30	5.0
	6.3	8	4700	140	0.24	0.042	0.084	1400	10	35	5.0
	6.3	8	6800	172	0.24	0.035	0.075	1630	10	35	5.0
	6.3	8	10000	247	0.25	0.032	0.064	1950	10	40	5.0
	6.3	8	15000	295	0.28	0.028	0.056	2220	10	40	5.0
	6.3	8	22000	354	0.30	0.025	0.052	2330	10	40	5.0
	6.3	8	33000	430	0.34	0.024	0.046	2310	10	40	5.0
	6.3	8	47000	298	0.28	0.034	0.068	1660	15	30	7.5
	6.3	8	68000	354	0.30	0.028	0.056	2070	15	35	7.5
	6.3	8	100000	430	0.32	0.025	0.050	2350	16	31.5	7.5
	6.3	8	150000	518	0.36	0.022	0.044	2550	16	35.5	7.5
	6.3	8	220000	758	0.44	0.020	0.040	2970	16	40	7.5
	6.3	8	330000	209	0.26	0.043	0.086	1460	18	19	7.5
	6.3	8	470000	354	0.30	0.030	0.060	1850	18	20	7.5
	6.3	8	680000	430	0.32	0.027	0.054	2120	18	25	7.5
	6.3	8	1000000	632	0.40	0.023	0.046	2410	18	31.5	7.5
	6.3	8	1500000	758	0.44	0.019	0.038	2680	18	35.5	7.5
	6.3	8	2200000	947	0.50	0.018	0.036	3010	18	40	7.5

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