OUTLINE (Type ACA)

Type ACA is an aluminum solid electrolytic capacitor which uses conductive polymer as cathode layer. In order to meet customer needs of digitization and higher frequency of electronics device, we have developed conductive polymer aluminum solid electrolytic capacitor with ULTRA Low ESR, which is excellent in electrically conductive and high-temperature stability.

APPLICATION

Computer, computer peripherals, mother board, DC/DC converter and, regulator peripherals.

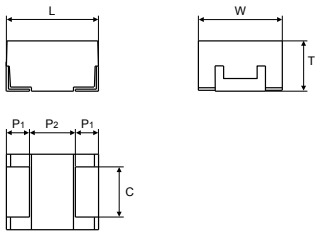
FEATURES

1 . Low ESR and Low impedance
Using conductive polymer as cathode layer makes lower ESR and impedance possible, especially at high-frequency range.
2 . Temperature Stability
ESR and capacitance are stable from low temperature through high temperature.
3 . Category temperature range is -55°C to +105°C. No derating with temperature is required.
4 . Failure mode
ACA offers very safe characteristics which makes ignition and smorking harder by taking advantages of characteristics of materials if the capacitor be short-circuited.
5 . Lead free and RoHS compliant.

RATING

Item	Rating
Category Temperature Range (Operating Temperature Range)	−55 ～+105℃
Rated Temperature (Max. Operating Temp. at Rated Voltage)	+105℃
Rated Voltage	2 - 2.5 - 4 - 6.3 - 8 - 10 - 16 VDC
Capacitance	6.8～470 μF
Capacitance Tolerance	±20%

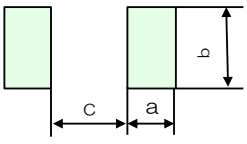
DIMENSIONS



(mm)

Case Size	L	W	T	P_1±0.2	P_2 min.	C±0.2
20D	7.3±0.2	4.3±0.2	1.9±0.1	1.3	4.1	2.4
31D	7.3±0.2	4.3±0.2	2.8±0.3	1.3	4.1	2.4
45D	7.3±0.3	4.3±0.3	4.2±0.3	1.3	4.0	2.4

RECOMMENDED PAD DIMENSIONS

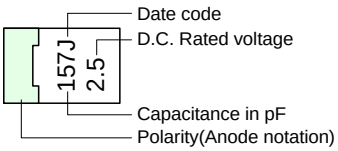


(mm)

Case Size	EIA Code	a	b	c
20D,31D,45D	7343	2.4	2.7	4.6

In order to expect the self alignment effect, it is recommended that land width is almost the same size as terminal of capacitor, and space between lands(c) nearly equal to the space between terminals for appropriate soldering.

MARKING



Note :Manufacturing date codes are based on the attachment table 13 of JIS C 5101.

ORDERING INFORMATION

ACA	2001	107	M	R	20D	0016
TYPE	RATED VOLTAGE	CAPACITANCE	CAPACITANCE TOLERANCE	STYLE OF REELED PACKAGE	CASE CODE	ESR（mΩ）

Rated voltage	Marking
2V	2001
2.5V	2501
4V	4001
6.3V	6301
8V	8001
10V	1002
16V	1602

Capacitance	Marking
6.8 μF	685
10 μF	106
15 μF	156
22 μF	226
33 μF	336
47 μF	476
56 μF	566
68 μF	686
82 μF	826
100 μF	107
120 μF	127
150 μF	157
180 μF	187
220 μF	227
270 μF	277
330 μF	337
390 μF	397
470 μF	477

Capacitance Tolerance	Marking
±20%	M

Code	Reel Size	Anode Notation
R	φ 180 Reel	Feed hole: −
N	φ 330 Reel	Feed hole: −

Case Code	Height of component max. (mm)	EIA Code
20D	2.0	7343L
31D	3.1	7343
45D	4.5	7343H

STANDARD RATING

November,2010

R.V.(VDC) / Cap.(μF)	2	2.5	4	6.3	8	10	16
6.8							20D
10				20D	20D	20D	20D
15							20D
22				20D	20D	20D	31D
33				20D	20D	20D	
47				20D			
56				20D			
68			20D	20D	31D	31D	
82		20D	20D				
100	20D	20D	20D	20D,31D	45D	45D	
120			31D	31D			
150	20D	20D,31D	20D,31D	31D,45D	45D	45D	
180		31D,45D	31D,45D	45D			
220	20D,31D	31D,45D	31D,45D				
270		45D	45D				
330	31D	45D	45D	45D			
390	45D						
470	45D						

CATALOG NUMBERS AND RATING

November, 2010

Catalog number (1)	Rated Voltage (VDC)	Capacitance (µF)	Tolerances (±%)	Case Code	Lct. (µA)		Dissipation Factor	ESR (mΩ) 100kHz	Max. permissible Ripple Current (2) (mArms) 100 kHz
					20℃	105℃			
ACA 2001 107 M _ 1 20D 0016	2	100	20	20D	12.0	24.0	0.06	16	2.1
ACA 2001 157 M _ 1 20D 0009	2	150	20	20D	18.0	36.0	0.06	9	2.8
ACA 2001 227 M _ 1 20D 0009	2	220	20	20D	26.4	52.8	0.06	9	2.8
ACA 2001 227 M _ 1 20D 0015	2	220	20	20D	26.4	52.8	0.06	15	2.2
ACA 2001 227 M _ 1 31D 0009	2	220	20	31D	26.4	52.8	0.06	9	3.1
ACA 2001 227 M _ 1 31D 0015	2	220	20	31D	26.4	52.8	0.06	15	2.4
ACA 2001 337 M _ 1 31D 0007	2	330	20	31D	39.6	79.2	0.06	7	3.5
ACA 2001 337 M _ 1 31D 0012	2	330	20	31D	39.6	79.2	0.06	12	2.7
ACA 2001 397 M N 45D 0007	2	390	20	45D	46.8	93.6	0.06	7	3.8
ACA 2001 477 M N 45D 0007	2	470	20	45D	56.4	113	0.06	7	3.8
ACA 2001 477 M N 45D 0010	2	470	20	45D	56.4	113	0.06	10	3.2
ACA 2501 826 M _ 1 20D 0018	2.5	82	20	20D	12.3	24.6	0.06	18	2.0
ACA 2501 107 M _ 1 20D 0015	2.5	100	20	20D	15.0	30.0	0.06	15	2.2
ACA 2501 157 M _ 1 20D 0016	2.5	150	20	20D	22.5	45.0	0.06	16	2.1
ACA 2501 157 M _ 1 31D 0015	2.5	150	20	31D	22.5	45.0	0.06	15	2.4
ACA 2501 187 M _ 1 31D 0015	2.5	180	20	31D	27.0	54.0	0.06	15	2.4
ACA 2501 187 M N 45D 0015	2.5	180	20	45D	27.0	54.0	0.06	15	2.6
ACA 2501 227 M _ 1 31D 0010	2.5	220	20	31D	33.0	66.0	0.06	10	2.9
ACA 2501 227 M N 45D 0010	2.5	220	20	45D	33.0	66.0	0.06	10	3.2
ACA 2501 277 M N 45D 0010	2.5	270	20	45D	40.5	81.0	0.06	10	3.2
ACA 2501 337 M N 45D 0010	2.5	330	20	45D	49.5	99.0	0.06	10	3.2
ACA 4001 686 M _ 1 20D 0018	4	68	20	20D	16.3	32.6	0.06	18	2.0
ACA 4001 826 M _ 1 20D 0018	4	82	20	20D	19.7	39.4	0.06	18	2.0
ACA 4001 826 M _ 1 20D 0028	4	82	20	20D	19.7	39.4	0.06	28	1.6
ACA 4001 107 M _ 1 20D 0015	4	100	20	20D	24.0	48.0	0.06	15	2.2
ACA 4001 127 M _ 1 31D 0015	4	120	20	31D	28.8	57.6	0.06	15	2.4
ACA 4001 157 M _ 1 20D 0016	4	150	20	20D	36.0	72.0	0.06	16	2.1
ACA 4001 157 M _ 1 31D 0015	4	150	20	31D	36.0	72.0	0.06	15	2.4
ACA 4001 187 M _ 1 31D 0015	4	180	20	31D	43.2	86.4	0.06	15	2.4
ACA 4001 187 M N 45D 0010	4	180	20	45D	43.2	86.4	0.06	10	3.2
ACA 4001 187 M N 45D 0015	4	180	20	45D	43.2	86.4	0.06	15	2.6
ACA 4001 227 M _ 1 31D 0010	4	220	20	31D	52.8	106	0.06	10	2.9
ACA 4001 227 M N 45D 0010	4	220	20	45D	52.8	106	0.06	10	3.2
ACA 4001 227 M N 45D 0015	4	220	20	45D	52.8	106	0.06	15	2.6
ACA 4001 277 M N 45D 0010	4	270	20	45D	64.8	130	0.06	10	3.2
ACA 4001 337 M N 45D 0010	4	330	20	45D	79.2	158	0.06	10	3.2
ACA 6301 106 M _ 1 20D 0055	6.3	10	20	20D	2.52	5.04	0.06	55	1.1
ACA 6301 226 M _ 1 20D 0045	6.3	22	20	20D	5.54	11.1	0.06	45	1.3
ACA 6301 336 M _ 1 20D 0025	6.3	33	20	20D	8.32	16.6	0.06	25	1.7
ACA 6301 476 M _ 1 20D 0025	6.3	47	20	20D	11.8	23.7	0.06	25	1.7
ACA 6301 566 M _ 1 20D 0025	6.3	56	20	20D	14.1	28.2	0.06	25	1.7
ACA 6301 686 M _ 1 20D 0015	6.3	68	20	20D	17.1	34.3	0.06	15	2.2
ACA 6301 686 M _ 1 20D 0025	6.3	68	20	20D	17.1	34.3	0.06	25	1.7
ACA 6301 107 M _ 1 20D 0015	6.3	100	20	20D	25.2	50.4	0.06	15	2.2
ACA 6301 107 M _ 1 31D 0018	6.3	100	20	31D	25.2	50.4	0.06	18	2.2
ACA 6301 127 M _ 1 31D 0015	6.3	120	20	31D	30.2	60.4	0.06	15	2.4
ACA 6301 157 M _ 1 31D 0010	6.3	150	20	31D	37.8	75.6	0.06	10	2.9
ACA 6301 157 M _ 1 31D 0015	6.3	150	20	31D	37.8	75.6	0.06	15	2.4
ACA 6301 157 M N 45D 0015	6.3	150	20	45D	37.8	75.6	0.06	15	2.6
ACA 6301 187 M N 45D 0010	6.3	180	20	45D	45.4	90.7	0.06	10	3.2
ACA 6301 337 M N 45D 0009	6.3	330	20	45D	83.2	166	0.06	9	3.4
ACA 8001 106 M _ 1 20D 0055	8	10	20	20D	3.2	6.4	0.06	55	1.1
ACA 8001 226 M _ 1 20D 0045	8	22	20	20D	7.04	14.1	0.06	45	1.3
ACA 8001 336 M _ 1 20D 0025	8	33	20	20D	10.6	21.1	0.06	25	1.7
ACA 8001 686 M _ 1 31D 0015	8	68	20	31D	21.8	43.5	0.06	15	2.4
ACA 8001 107 M N 45D 0010	8	100	20	45D	32.0	64.0	0.06	10	3.2
ACA 8001 157 M N 45D 0010	8	150	20	45D	48.0	96.0	0.06	10	3.2
ACA 1002 106 M _ 1 20D 0055	10	10	20	20D	4.0	8.0	0.06	55	1.1
ACA 1002 226 M _ 1 20D 0045	10	22	20	20D	8.8	17.6	0.06	45	1.3
ACA 1002 336 M _ 1 20D 0025	10	33	20	20D	13.2	26.4	0.06	25	1.7
ACA 1002 686 M _ 1 31D 0015	10	68	20	31D	27.2	54.4	0.06	15	2.4
ACA 1002 107 M N 45D 0010	10	100	20	45D	40.0	80.0	0.06	10	3.2
ACA 1002 107 M N 45D 0015	10	100	20	45D	40.0	80.0	0.06	15	2.6
ACA 1002 157 M N 45D 0010	10	150	20	45D	60.0	120	0.06	10	3.2
ACA 1602 685 M _ 1 20D 0070	16	6.8	20	20D	10.9	21.8	0.10	70	1.0
ACA 1602 106 M _ 1 20D 0060	16	10	20	20D	16.0	32.0	0.10	60	1.1
ACA 1602 156 M _ 1 20D 0040	16	15	20	20D	24.0	48.0	0.10	40	1.3
ACA 1602 226 M _ 1 31D 0030	16	22	20	31D	35.2	70.4	0.10	30	1.6

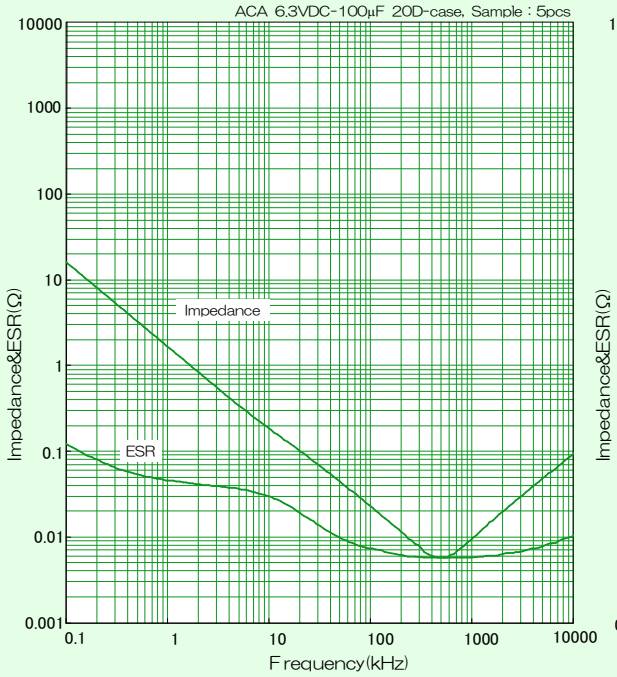
(1) _ 1 : No code for single item. “R” or “N” for taping specification.

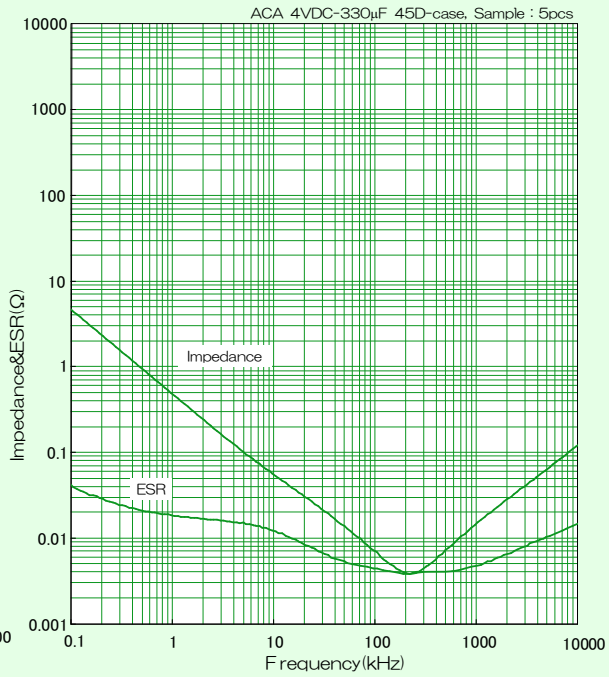
(2) Reference value.

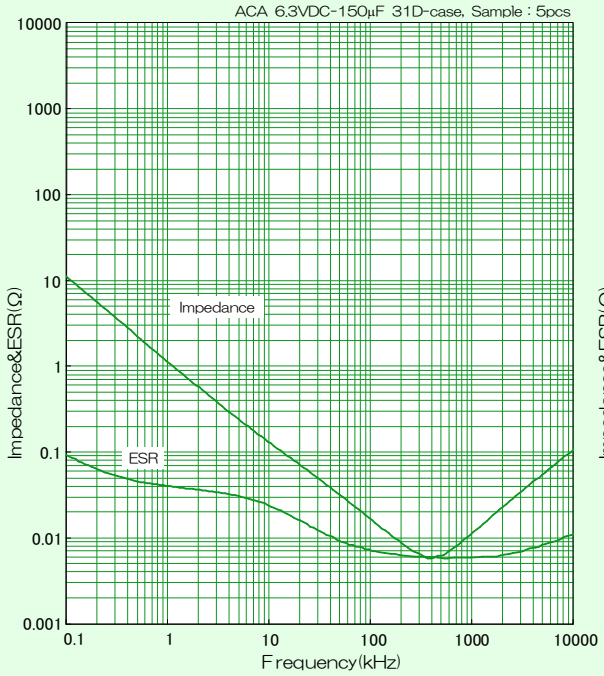
PERFORMANCE

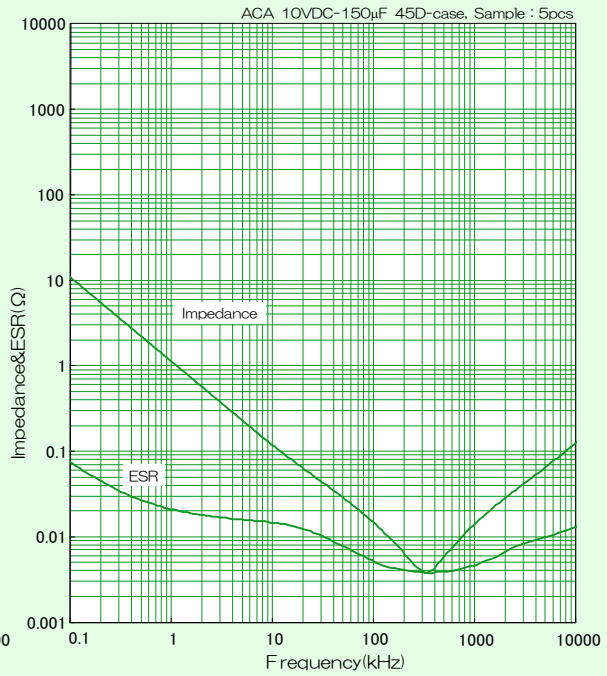
No	Item	Performance			Test Method
1	Leakage Current (μA)	In case of less than 4R.V., Leakage Current is 0.06CV Max.. In case of 6.3~10R.V., Leakage Current is 0.04CV Max.. In case of 16R.V., Leakage Current is 0.1CV Max..			JIS C 5101-1 4.9 Applied voltage: Rated voltage for 2 minutes through 1000Ω resistance.
2	Capacitance (μF)	Shall be within specified tolerance.			JIS C 5101-1 4.7 120Hz
3	Dissipation Factor	Shall not exceed the values shown in CATALOG NUMBERS AND RATING.			JIS C 5101-1 4.8 120Hz
4	Equivalent Series Resistance	Shall not exceed the values shown in CATALOG NUMBERS AND RATING.			EIAJ RC-2460 4.5.4 100kHz
5	Characteristics at High and Low Temperature	Leakage Current	Capacitance	Dissipation Factor	JIS C 5101-1 4.29
	Step 1	Shall not exceed the value in No.1	Within the nominal value specified	Shall not exceed the value in No.3	20±2°C
	Step 2		Within ±15% of the value in Step 1	Shall not exceed the value in No.3	-55±3°C
	Step 3	Shall not exceed the value in No.1	Within ±5% of the value in Step 1	Shall not exceed the value in No.3	20±2°C
	Step 4	Shall not exceed two times of No.1	Within ±20% of the value in Step 1	Shall not exceed the value in No.3	105±2°C
	Step 5	Shall not exceed the value in No.1	Within ±5% of the value in Step 1	Shall not exceed the value in No.3	20±2°C
6	Surge	Leakage Current: Shall not exceed the value in No.1. Capacitance Change: Within ±10% of the value before the test Dissipation Factor: Shall not exceed the value in No.3. Visual Examination: There shall be no evidence of mechanical damage.			JIS C 5101-1 4.26 Temperature: 15~35°C Surge voltage: Rated voltage (VDC): 2 / 2.5 / 4 / 6.3 / 8 / 10 / 16 Surge voltage (VDC): 2.3 / 2.9 / 4.6 / 7.2 / 9.2 / 12 / 18 Protective resistance: 1000 Ω
7	Shear (formerly adhesion) Test	No separation of terminal from solder.			JIS C 5101-1 4.34 Reflow Temperature: 240±10°C / Time: 10 seconds or less Force: 5N Duration: 5±1s
8	Substrate Bending Test	Capacitance: Initial value to remain steady during measurement. Visual Examination: There shall be no evidence of damage.			JIS C 5101-1 4.35 Bending: 3mm
9	Vibration	Capacitance: Initial value to remain steady during measurement. Visual Examination: There shall be no evidence of damage.			JIS C 5101-1 4.17 Frequency range: 10-55Hz Swing width: 1.5mm Vibration direction: 3 directions with mutually right-angled Duration: 2 hours in each of these mutually perpendicular directions (total 6 hours) Mounting: Solder terminal to the printed board
10	Shock	There shall be no intermittent contact of 0.5ms or greater, short, or open. Nor shall there be any spark discharge, insulation breakdown, or evidence of mechanical damage.			JIS C 5101-1 4.19 Peak acceleration: 490m/s^2 Duration: 11ms Wave form: Half-sine
11	Solderability	Solder shall completely cover the terminal surface (there shall be no pin holes,nonwetting or solder repelling). However, no plating edges of the terminal shall not be evaluated.			JIS C 5101-1 4.15 Solder temperature: 235±5℃ Dipping time: 5±0.5 seconds Dipping depth: Terminal shall be dipped into melted solder
12	Resistance to Soldering Heat	Leakage Current: Shall not exceed the value in No.1. Capacitance Change: Within ±10% of the value before the test Dissipation Factor: Shall not exceed the value in No.3. Visual Examination: There shall be no evidence of mechanical damage.			EIAJ RC-2460 4.6 IR reflow method Preheat: 160±10℃ 120±10s Reflow: 230℃ 25~30s Peak 240℃ max. Number of cycle:2
13	Rapid Change of Temperature	Leakage Current: Shall not exceed the value in No.1. Capacitance Change: Within ±10% of the value before the test Dissipation Factor: Shall not exceed the value in No.3. Visual Examination: There shall be no evidence of mechanical damage.			JIS C5101-1 4.16 Step 1: -55±3℃ 30±3 minutes Step 2: 25 (-5/+10) ℃, 3 minutes or less Step 3: 105±2℃, 30±3 minutes Step 4: 25 (-5/+10) ℃, 3 minutes or less Number of cycle: 5
14	High Temperature / Moisture	Leakage Current: Shall not exceed 7.5 times the value in No.1. Capacitance Change: Within $^{+50}_{-20}$ % of the value before the test Dissipation Factor: Shall not exceed two times the value in No.3. Visual Examination: There shall be no evidence of mechanical damage.			JIS C5101-1 4.22 Temperature: 60±2℃ Moisture: 90~95%R.H. Duration: 500 (-0/+24) hours
15	High Temperature / Moisture load	Leakage Current: Shall not exceed the value in No.1. Capacitance Change: Within $^{+50}_{-20}$ % of the value before the test Dissipation Factor: Shall not exceed two times the value in No.3. Visual Examination: There shall be no evidence of mechanical damage.			JIS C5101-1 4.22 Temperature: 60±2℃ Moisture: 90~95%R.H. Applied voltage: Rated voltage Duration: 1000 (-0/+48) hours
16	High Temperature Storage	Leakage Current: Shall not exceed the value in No.1. Capacitance Change: Within ±10% of the value before the test Dissipation Factor: Shall not exceed the value in No.3. Visual Examination: There shall be no evidence of mechanical damage.			JIS C5101-1 4.25 Temperature: 105±2℃ Duration: 1000 (-0/+48) hours
17	Endurance	Leakage Current: Shall not exceed the value in No.1. Capacitance Change: Within ±10% of the value before the test Dissipation Factor: Shall not exceed the value in No.3. Visual Examination: There shall be no evidence of mechanical damage.			JIS C5101-1 4.23 Temperature: 105±2℃ Applied voltage: Rated voltage Duration: 1000 (-0/+48) hours

FREQUENCY CHARACTERISTICS

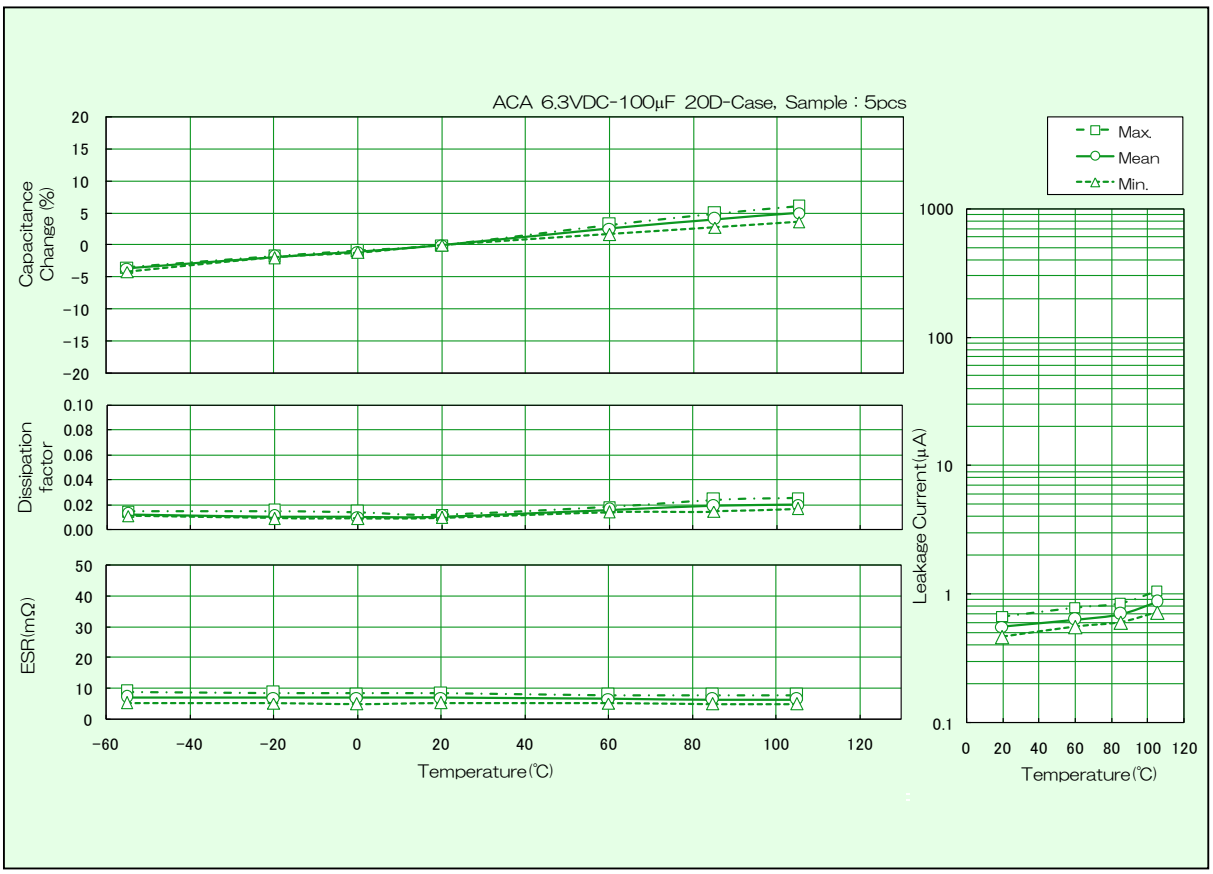


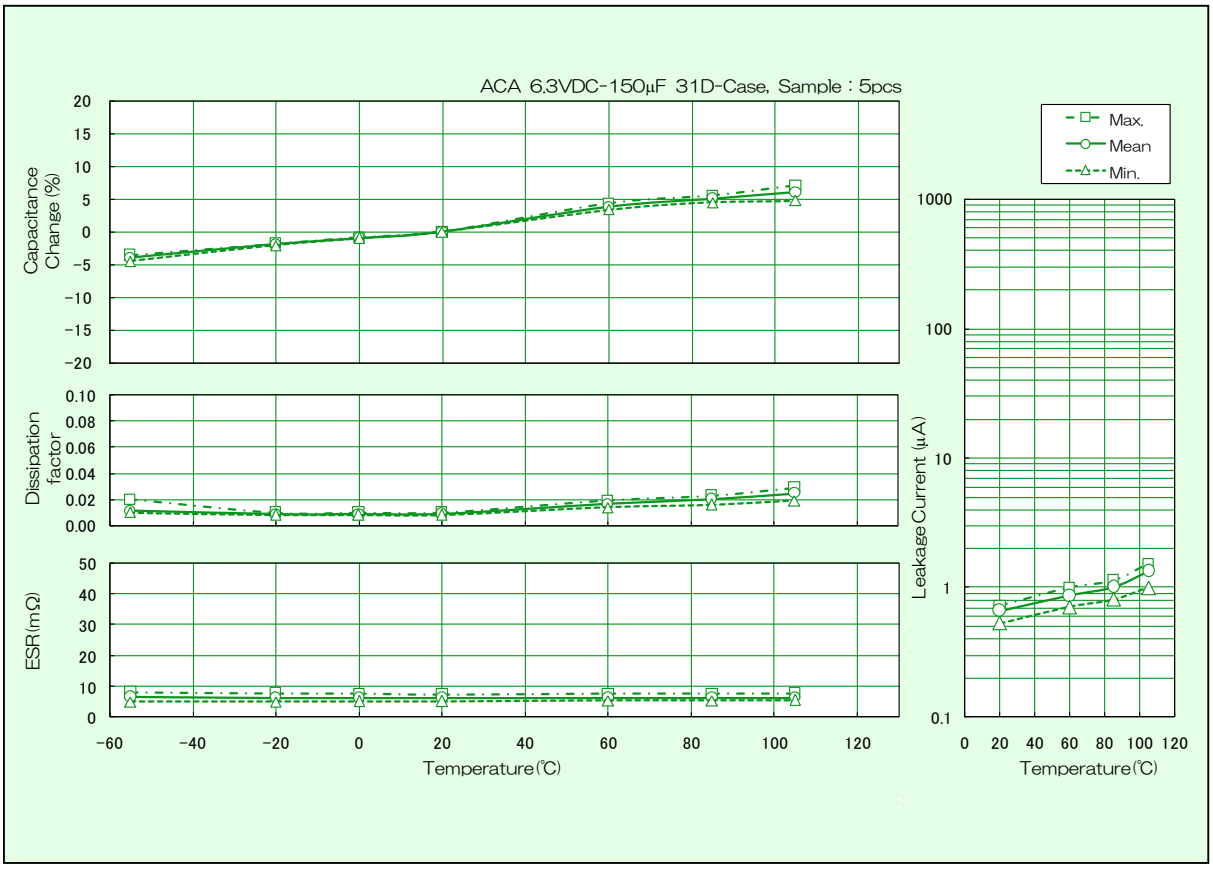


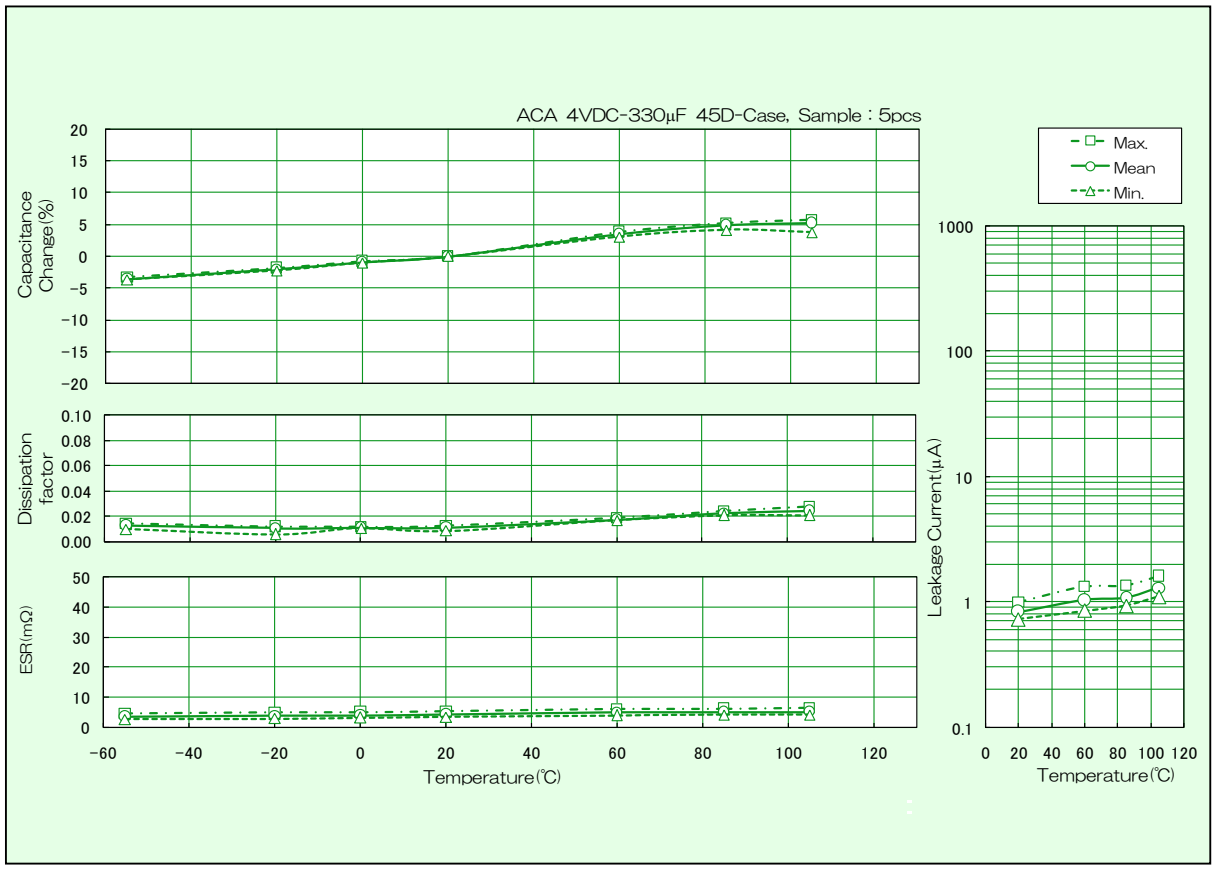


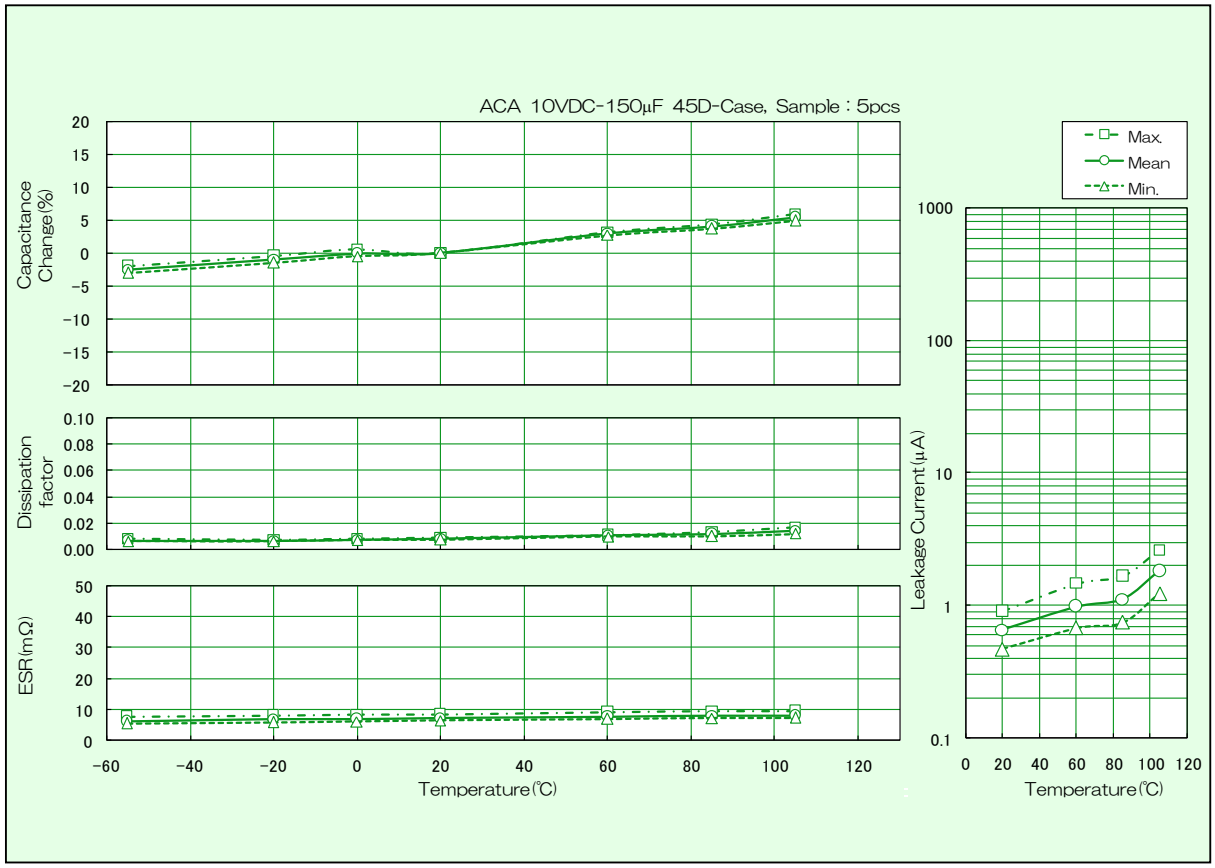


CHARACTERISTICS AT HIGH AND LOW TEMPERATURE

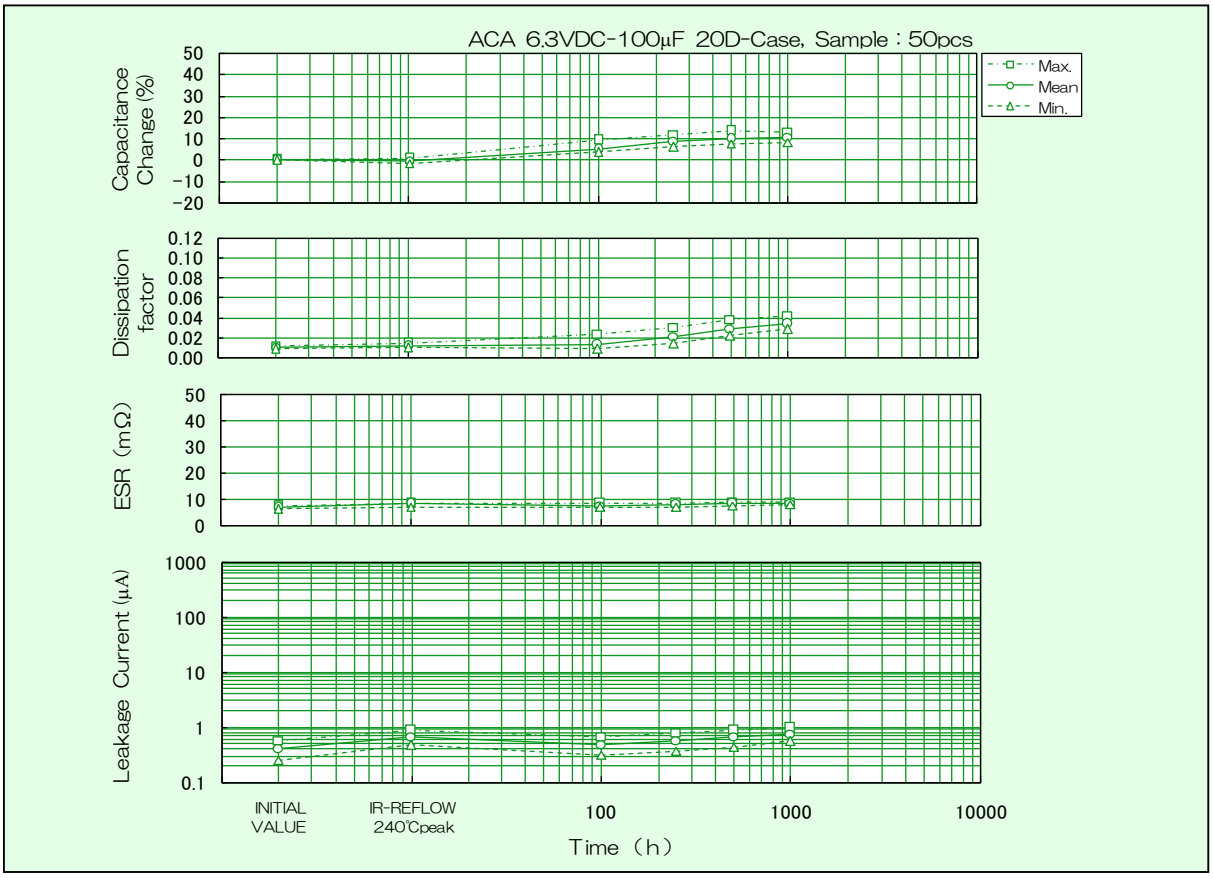


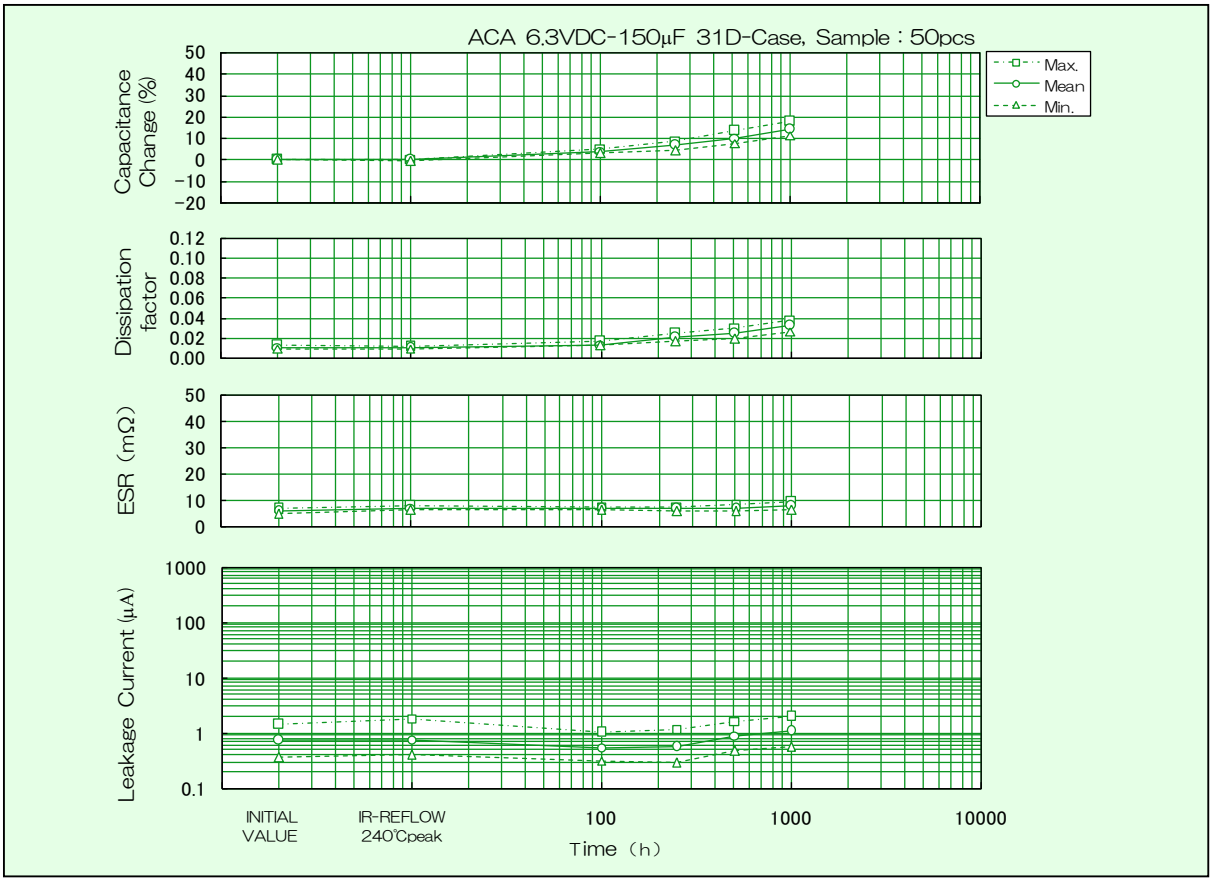


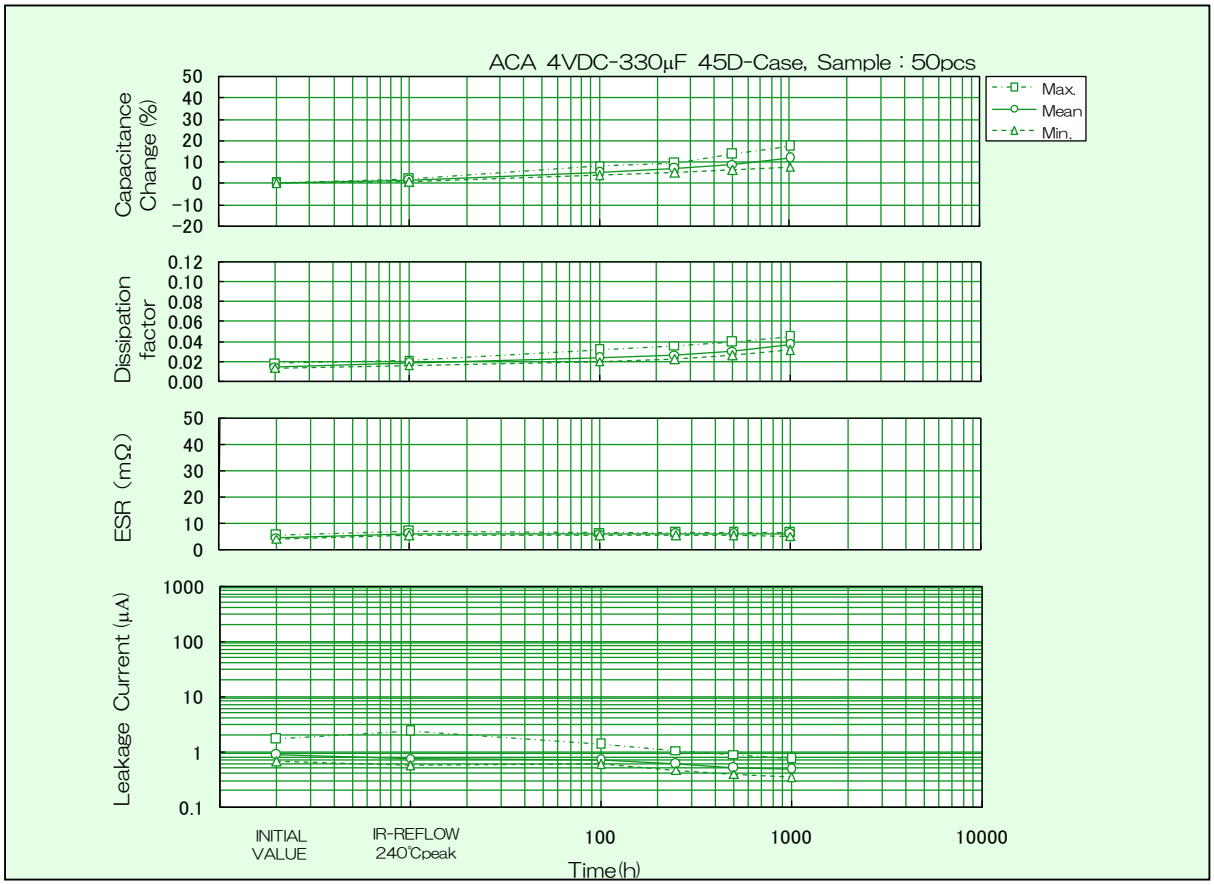


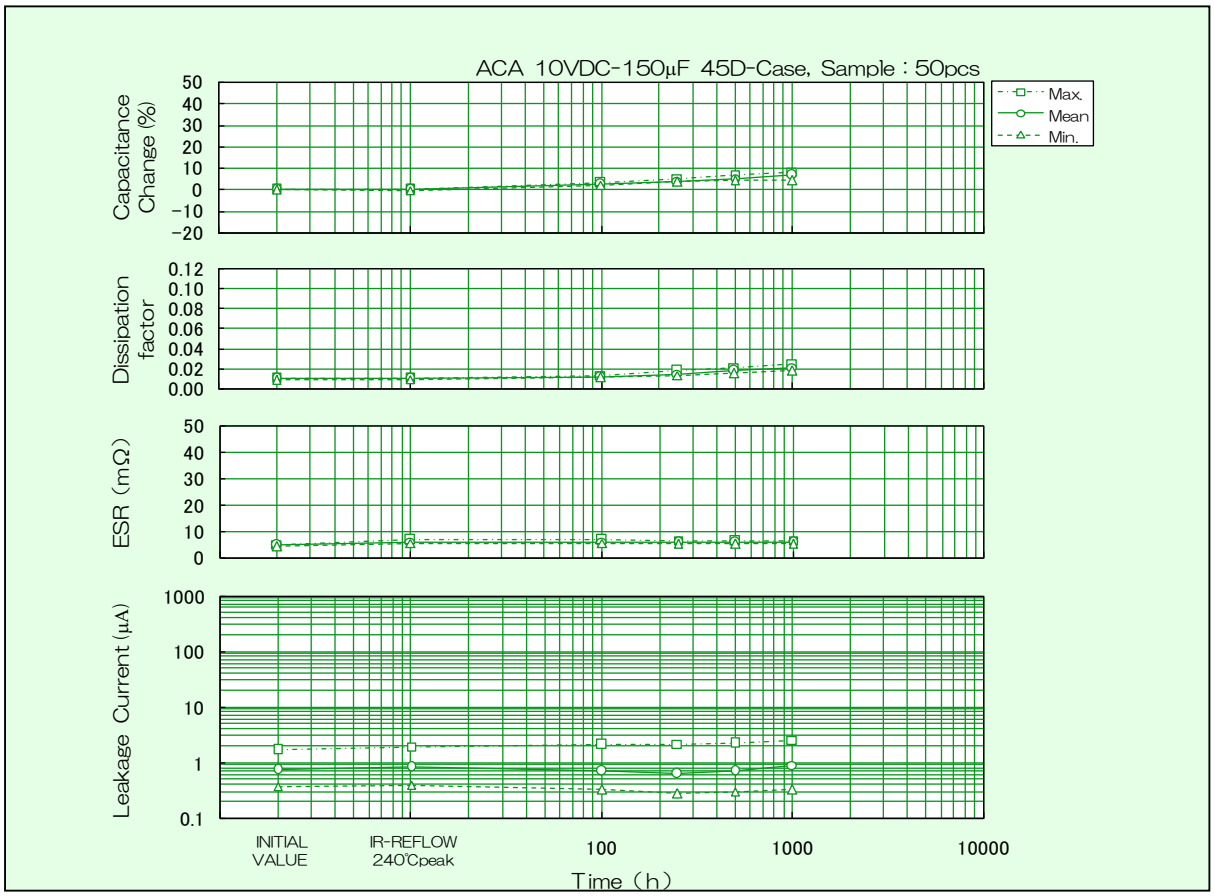


HIGH TEMPERATURE / MOISTURE LOAD 60℃ 90% RATED VOLTAGE

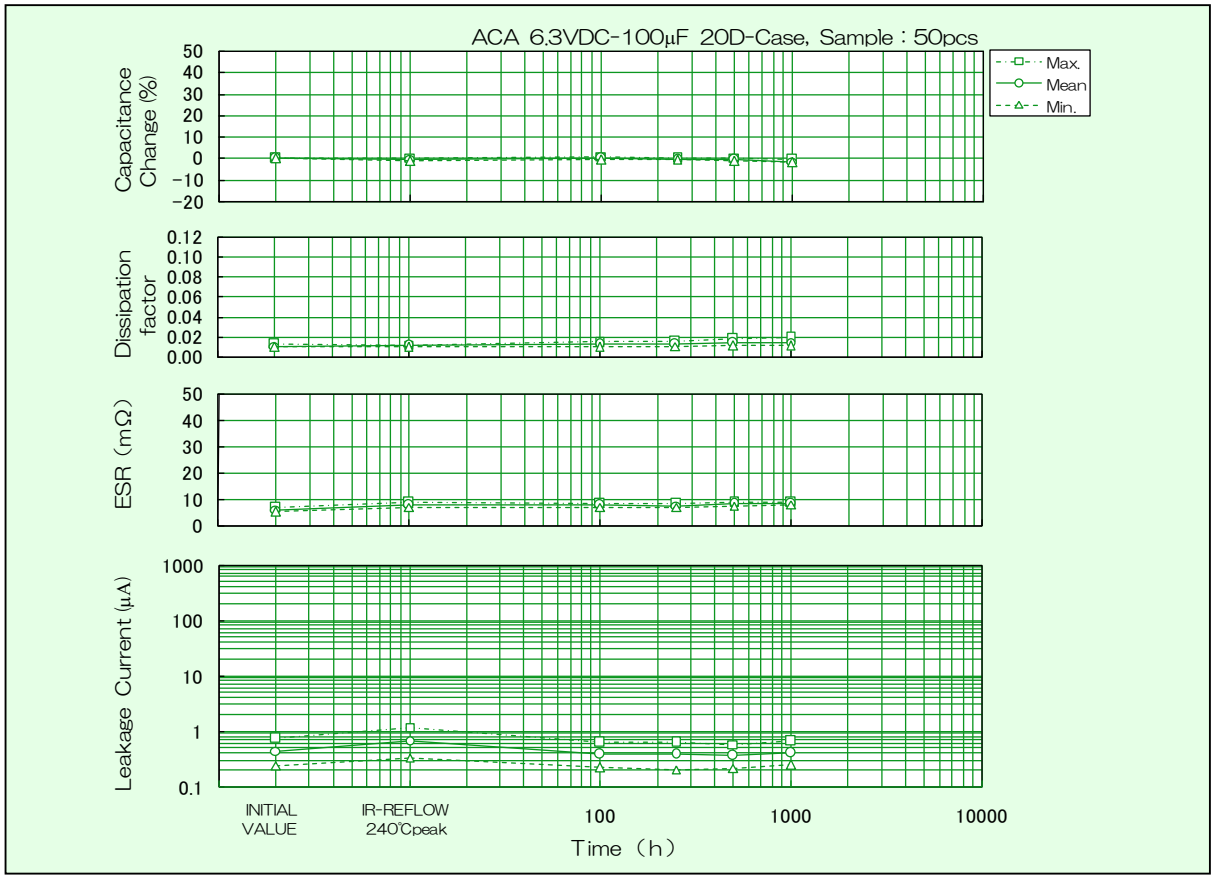


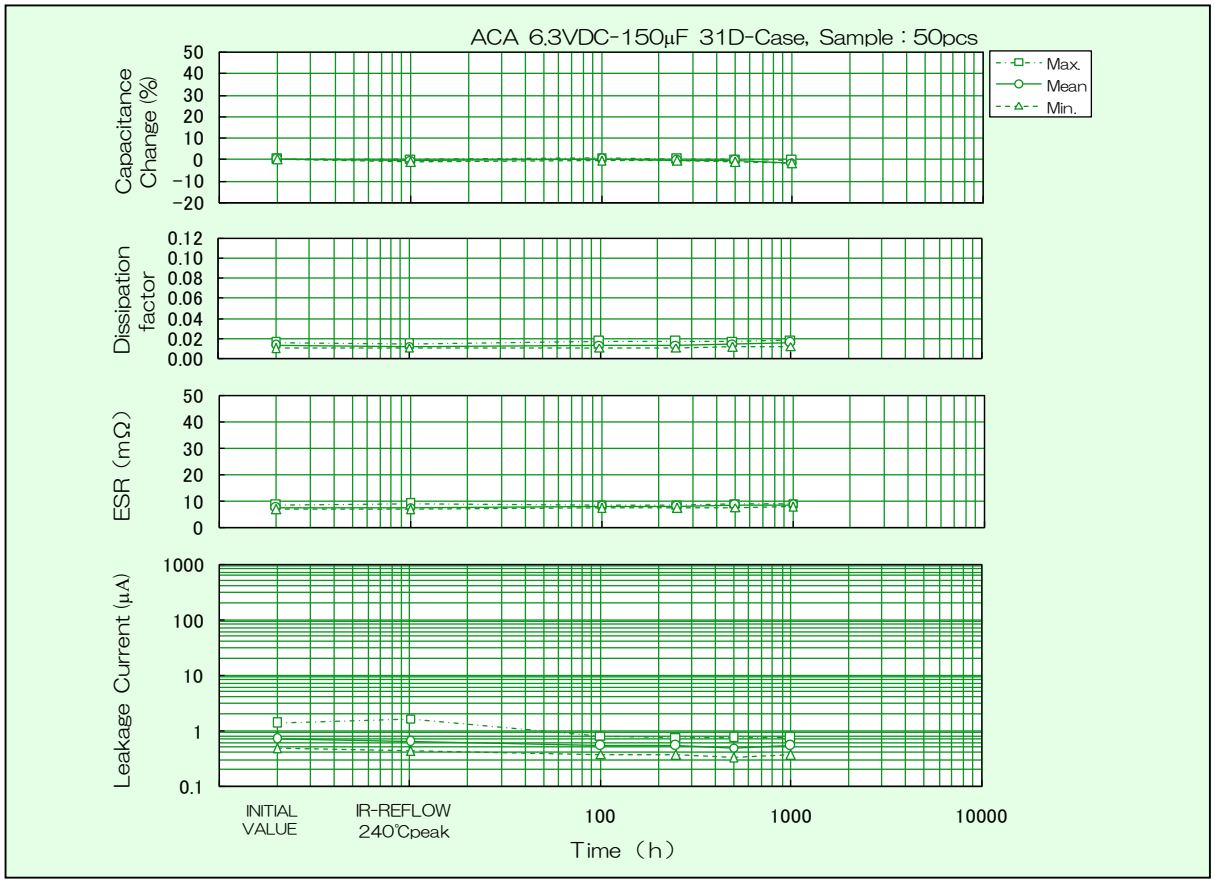


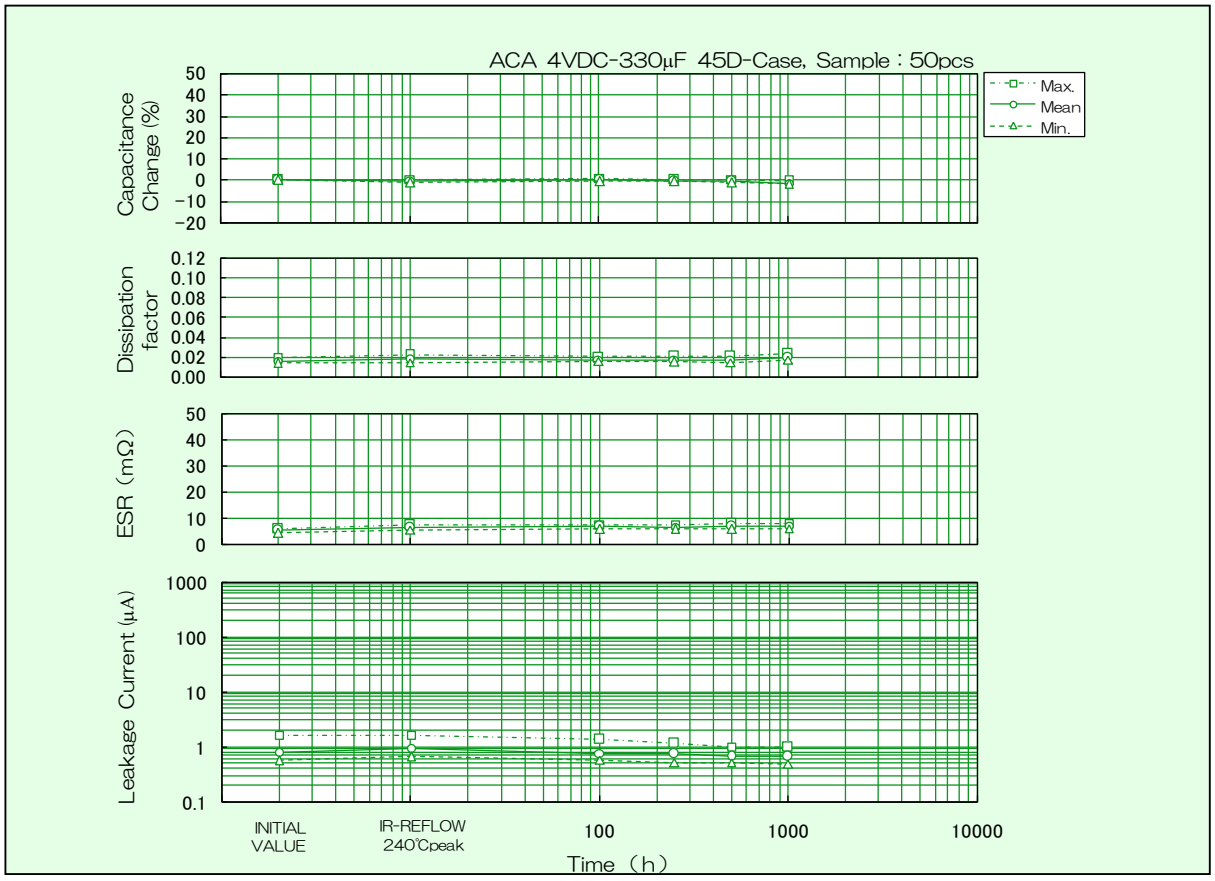


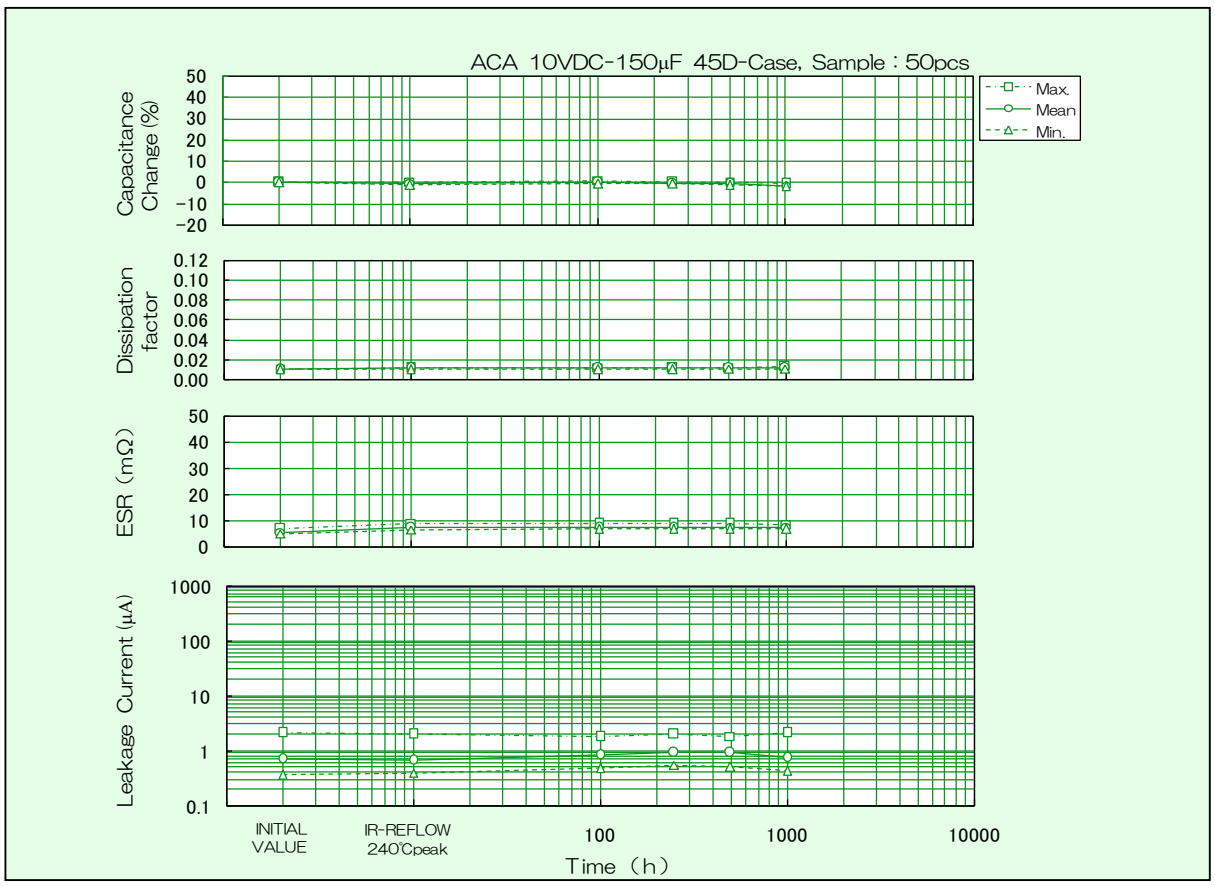


ENDURANCE 105℃ RATED VOLTAGE









■ Application Notes for Conductive Polymer Aluminum Solid Electrolytic Capacitor

1. Operating Voltage
Aluminum Capacitor shall be operated at the rated voltage or lower. Over rated voltage applied even for a short time may cause short failure.
When designing the circuit, the equipment's required reliability must be considered and appropriate voltage derating must be performed.

2. Application that contains AC Voltage
Special attention to the following 3 items.
(1) The sum of the DC bias voltage and the positive peak value of the AC voltage should not exceed the rated voltage.
(2) Reverse voltage should not exceed the allowable values of the negative peak AC voltage (refer page3)
(3) Ripple voltage should not exceed the allowable values.

3. Reverse Voltage
Special attention to the polar character.
Reverse Voltage should not be applied.

4. Permissible Ripple Current
Permissible ripple current and voltage is determined by the following formula and influenced by P max value and ESR standard value. Please consult us in case of different frequency.

$$P=I^2 \times ESR \text{ or } P=\frac{E^2 \times ESR}{Z^2}$$

Permissible ripple current $I_{max}=\sqrt{\frac{P\max}{ESR}}$ $(Arms)$

Permissible ripple voltage $E_{max}=\sqrt{\frac{P\max}{ESR}} \times Z = I_{max} \times Z\ (Vrms)$

I_{max} Permissible current at regulated frequency.
E_{max} Permissible voltage at regulated frequency.
P_{max} Permissible power less. (W)
ESR ESR valule at regulated frequency. (Ω)
Z Impedance at regulated frequency. (Ω)

Permissible power loss for each case.

Case size	P_{max} (W)	
	Ceramic board	Glass epoxy board
20D	0.110	0.072
31D	0.150	0.085
45D	0.165	0.100

Note: Above values are measured at 0.6t ceramic board-mounting and 0.8t glass epoxy board mounting in free air and may be changed depending on the kind of board, packing density, and air convection condition. Please consult us if calculated power loss value is different from above list of P max value.

5. Leakage current
Leakage current can be increased by heat and mechanical stress of soldering.
Turning on electricity decreases leakage current.

6. Non Polar Connection
Aluminum Solid Electrolytic Capacitor cannot be used as a non-polar unit.

7. Soldering
7.1. Pre-heating
To obtain optimal reliability, lowering the heat shock during the soldering process is favorable. Capacitors should be pre-heated at 130-160°C for approximately 60 seconds.
7.2. Soldering
The body of the capacitor should not exceed 240°C during soldering.
(1) Reflow Soldering
Reflow soldering is a process in which the capacitors are mounted on a printed board with solder paste. Two methods of Reflow Soldering: Direct and Atmospheric Heat
· Direct Heat (Hot plate)
· Atmospheric Heat
a) Near and Far IR Ray
b) Convection Oven
Vapor Phase Soldering and Flow Soldering are not recommended.
(2) Soldering Iron
Soldering with a soldering iron cannot be recommended due to the lack of consistency in maintaining temperatures and process times. If this method should be necessary, the iron should never touch the capacitor's terminals, and the temperature of the soldering iron should never exceed 350°C. The application of the iron should not exceed 3 seconds and 30 watt.
(3) Please consult us for other methods.

8. Solvent Cleaning
Cleaning by organic solvent may damage capacitor's appearance and performance. However, our capacitors are not effected even when soaked at 20-30°C 2-propanol for 5 minutes. When introducing new cleaning methods or changing the cleaning term, please consult us.

9. Ultrasonic cleaning
Ultrasonic cleaning under severe condition may break terminals. Also, from an electrical characteristics aspect, it is unfavorable. Therefore, please do not use ultrasonic cleaning if possible. If the Ultrasonic cleaning process will be used, please note the following.
(1) The solvent should not be boiled. (Lower the ultrasonic wave output or use solvent with the high boiling point.)
(2) The recommended wattage is less than 0.5 watts per cm^2.
(3) The cleaning time should be kept to a minimum. Also, samples must be swang in the solvent. Please consult us.

10. Storage
Capacitors should be tightly sealed in moisture prevention bag and stored with supplied reel.

MATSUO ELECTRIC CO., LTD.

Please feel free to ask our Sales Department for more information on the Conductive Polymer Aluminum Solid Electrolytic Capacitor.

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