



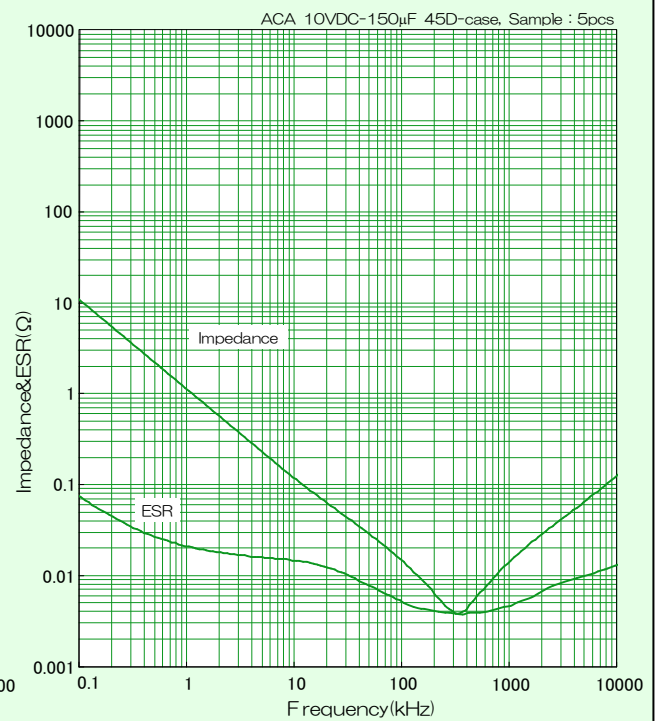
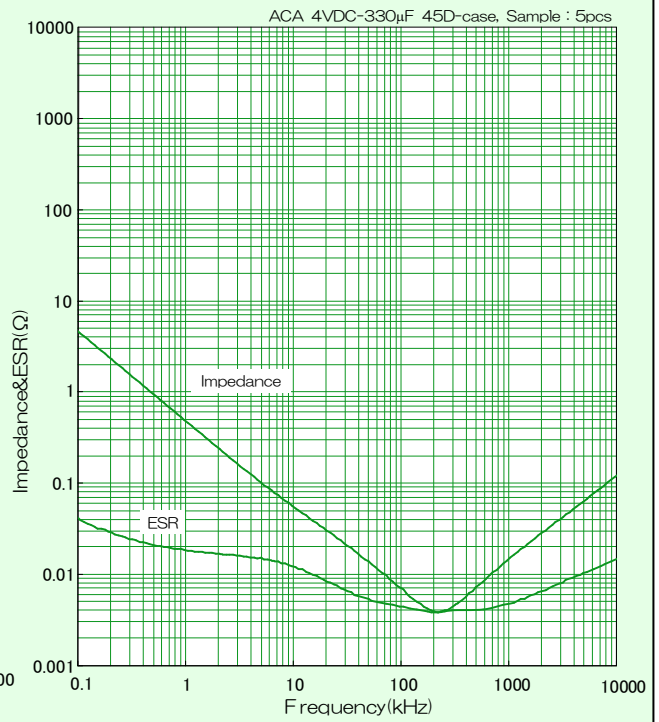
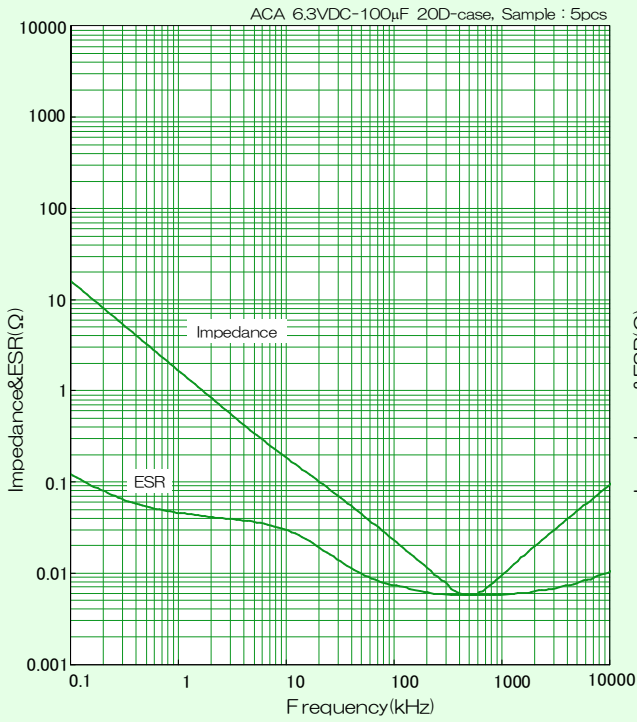




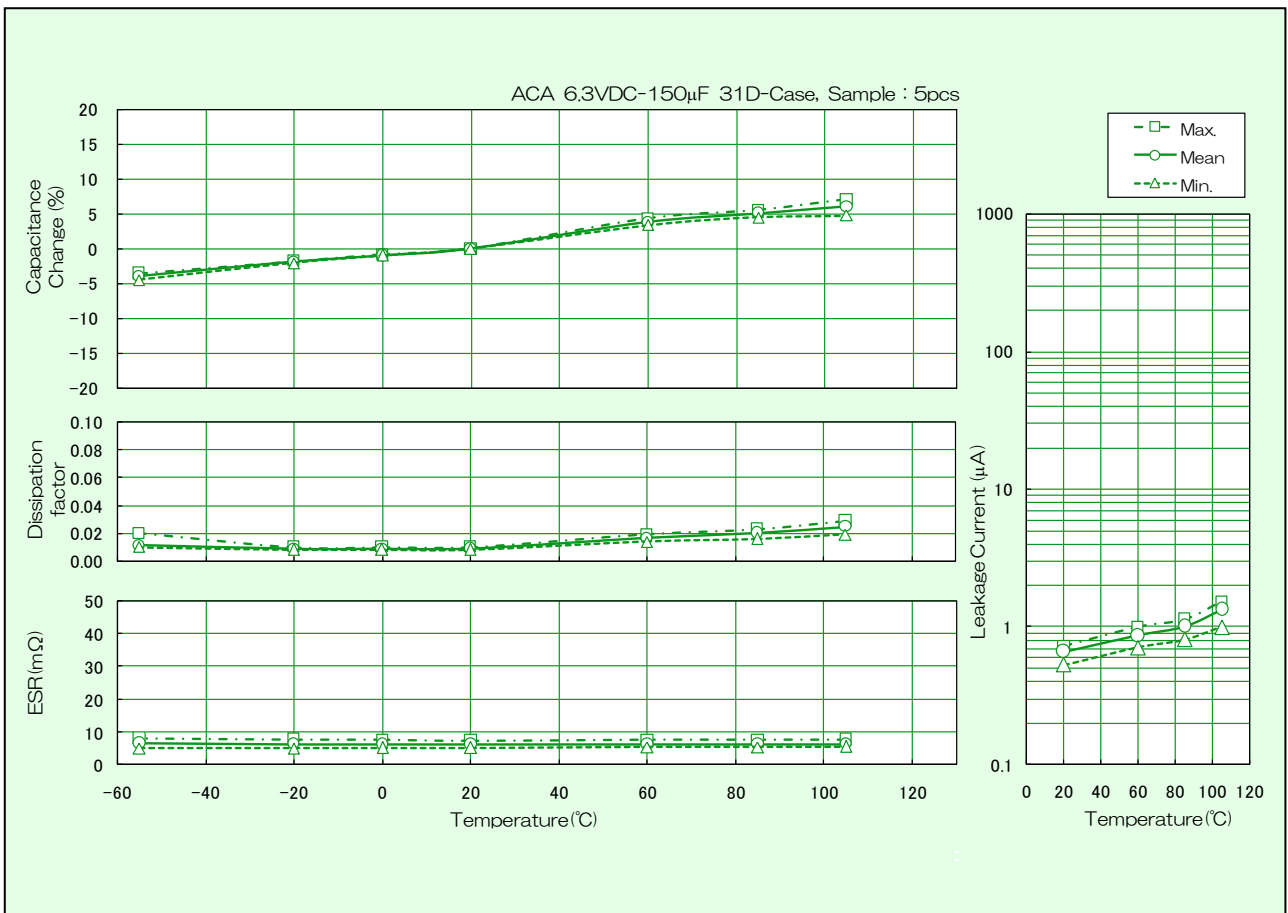
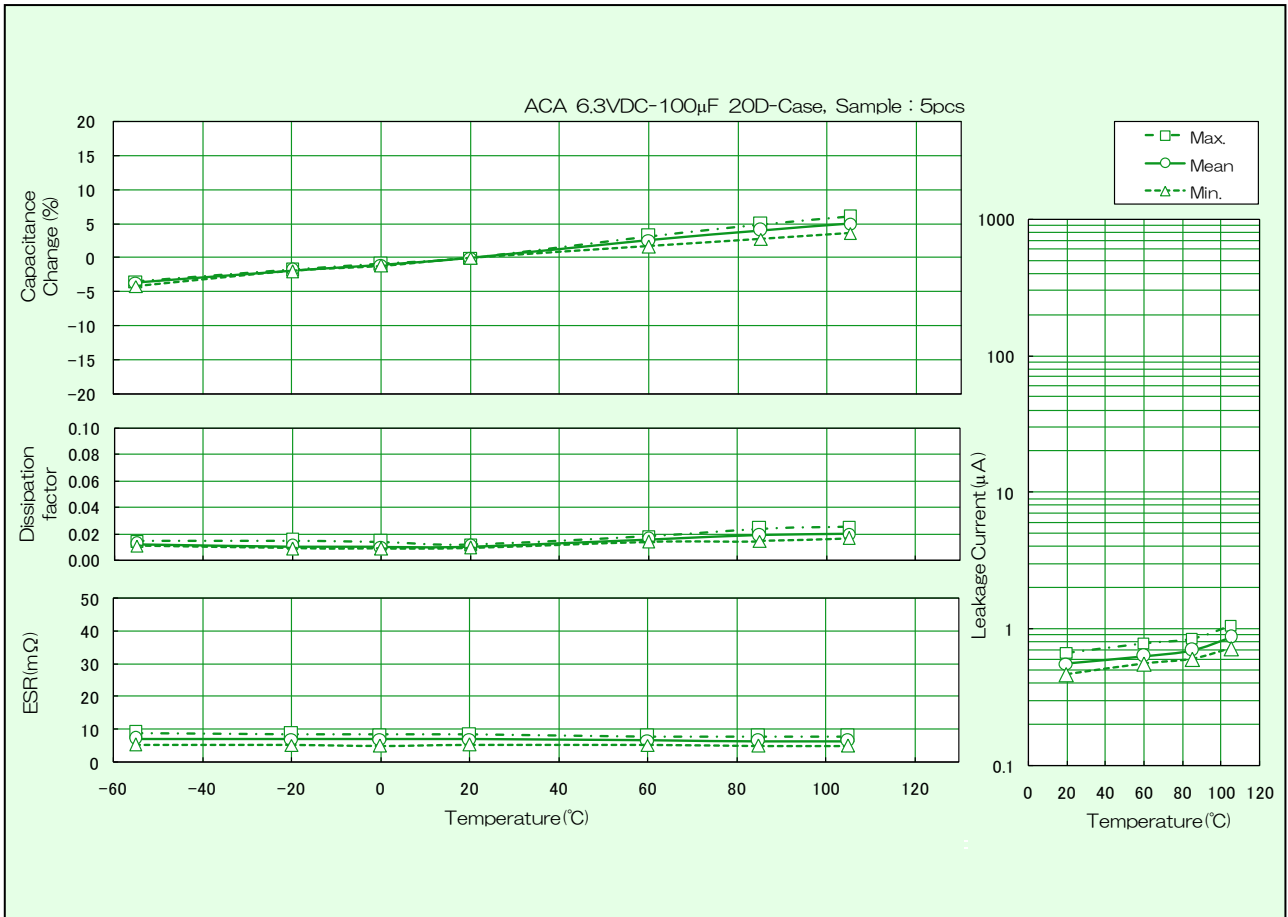
# PERFORMANCE

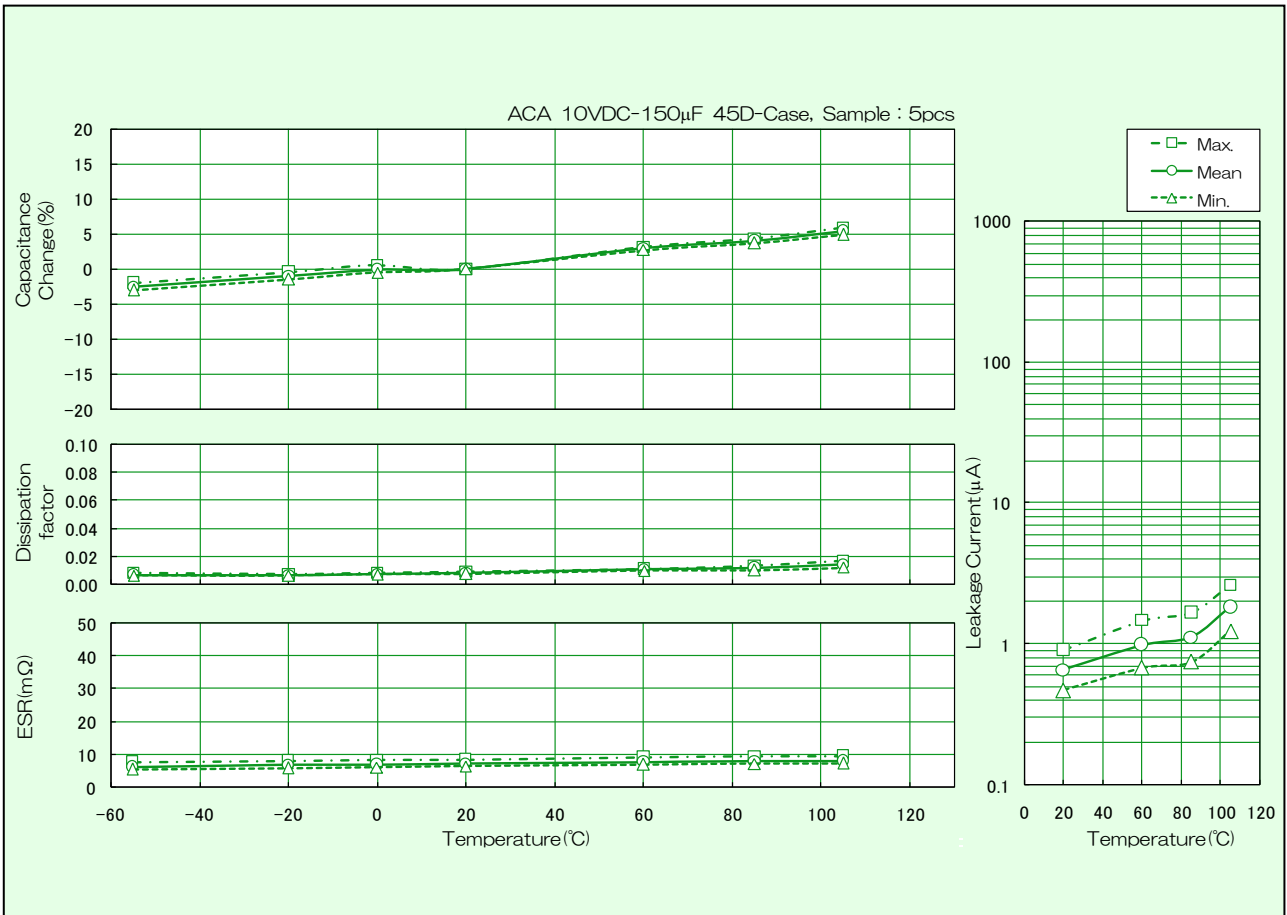
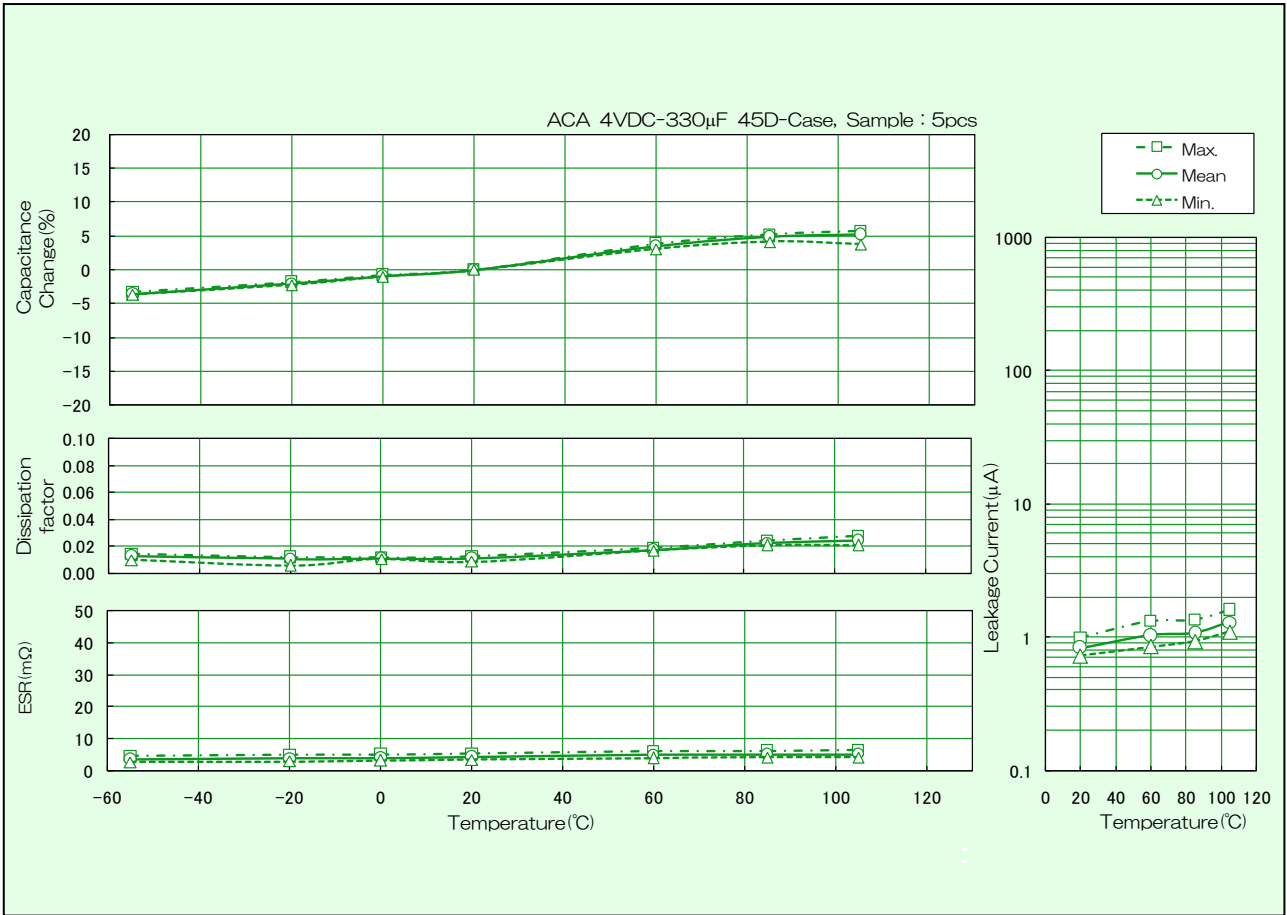
No	Item	Performance			Test Method														
1	Leakage Current (μA)	In case of less than 4R.V., Leakage Current is 0.06CV Max.. In case of more than 6.3R.V., Leakage Current is 0.04CV Max..			JIS C5101-1.4.9 Applied voltage: Rated voltage for 2 minutes through 1000Ω resistance.														
2	Capacitance (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 C5101-1.4.8 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 5101-1.4.2.9														
	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														
5	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: <table border="1"> <tr> <td>Rated voltage (VDC)</td> <td>2</td> <td>2.5</td> <td>4</td> <td>6.3</td> <td>8</td> <td>10</td> </tr> <tr> <td>Surge voltage (VDC)</td> <td>2.3</td> <td>2.9</td> <td>4.6</td> <td>7.2</td> <td>9.2</td> <td>12</td> </tr> </table> Protective resistance: 1000 Ω	Rated voltage (VDC)	2	2.5	4	6.3	8	10	Surge voltage (VDC)	2.3	2.9	4.6	7.2	9.2	12
	Rated voltage (VDC)	2	2.5	4	6.3	8	10												
	Surge voltage (VDC)	2.3	2.9	4.6	7.2	9.2	12												
	7	Shear (formerly adhesion) Test	No separation of terminal from solder.		JIS C5101-1.4.34 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 <sup>2</sup> 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°C 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°C 120±10s Reflow: 230°C 25~30s Peak 240°C 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°C 30±3 minutes Step 2: 25 (-5/+10) °C, 3 minutes or less Step 3: 105±2°C, 30±3 minutes Step 4: 25 (-5/+10) °C, 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% 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°C 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% 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°C 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°C 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°C Applied voltage: Rated voltage Duration: 1000 (-0/+48) hours															

# FREQUENCY CHARACTERISTICS

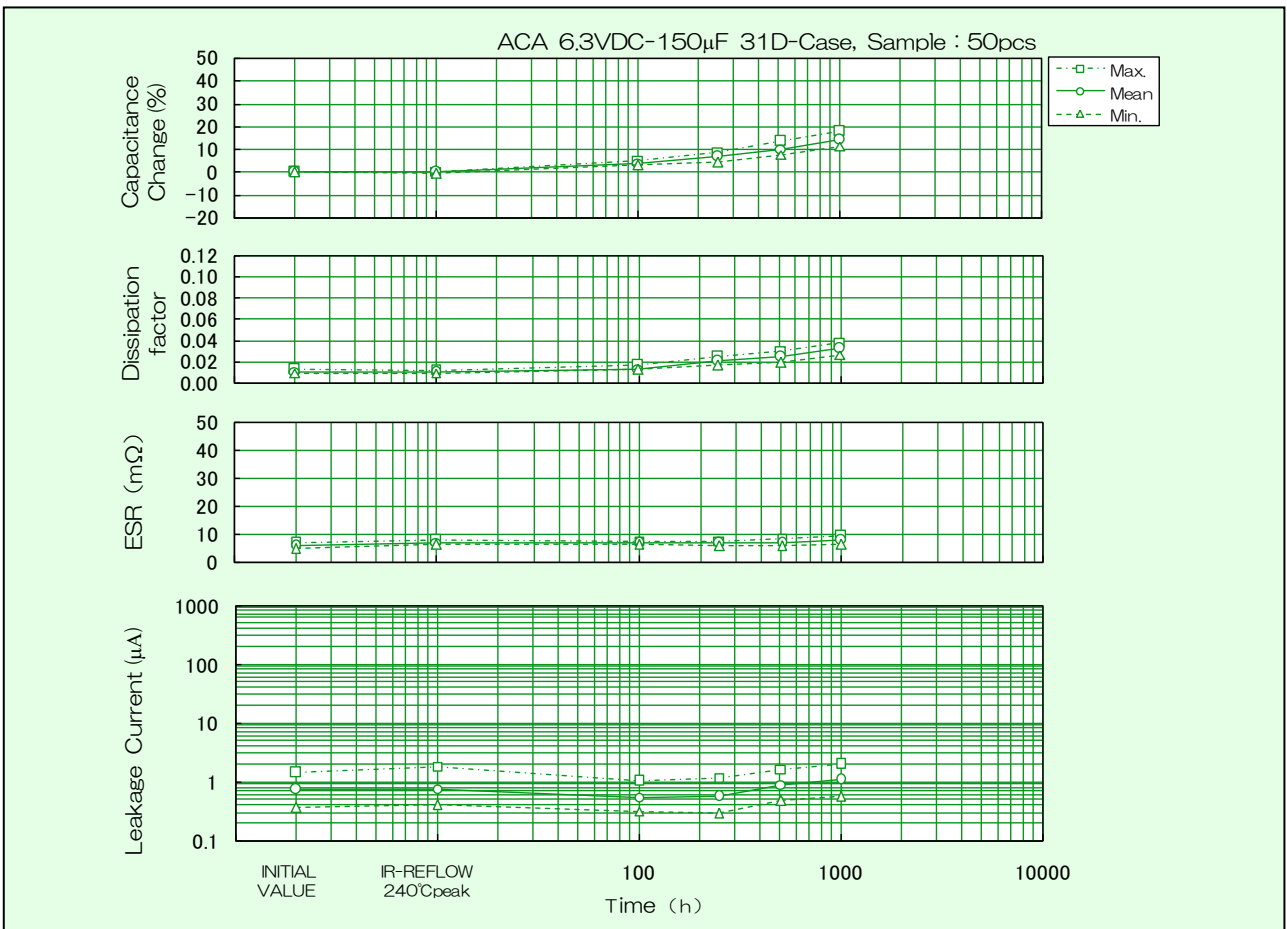
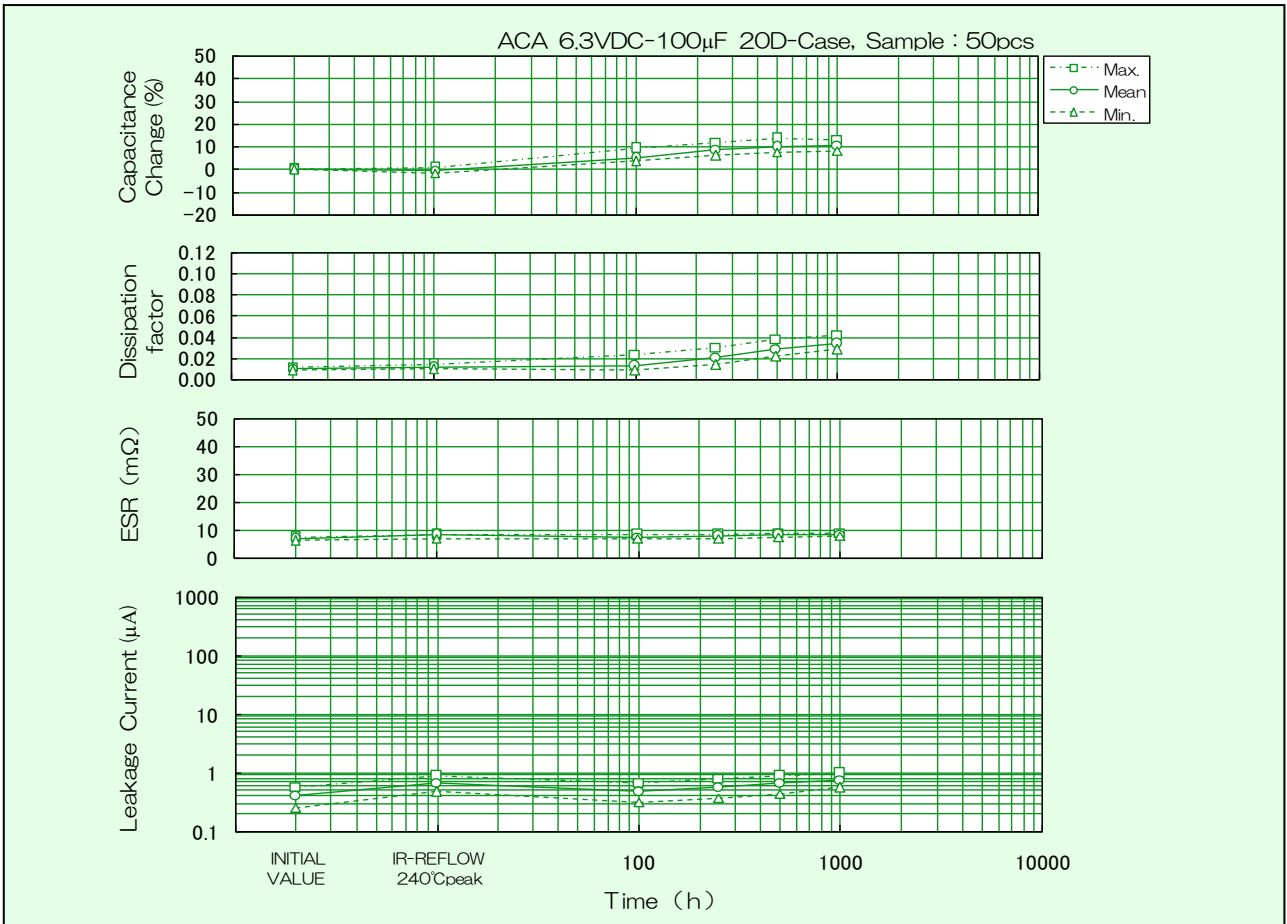


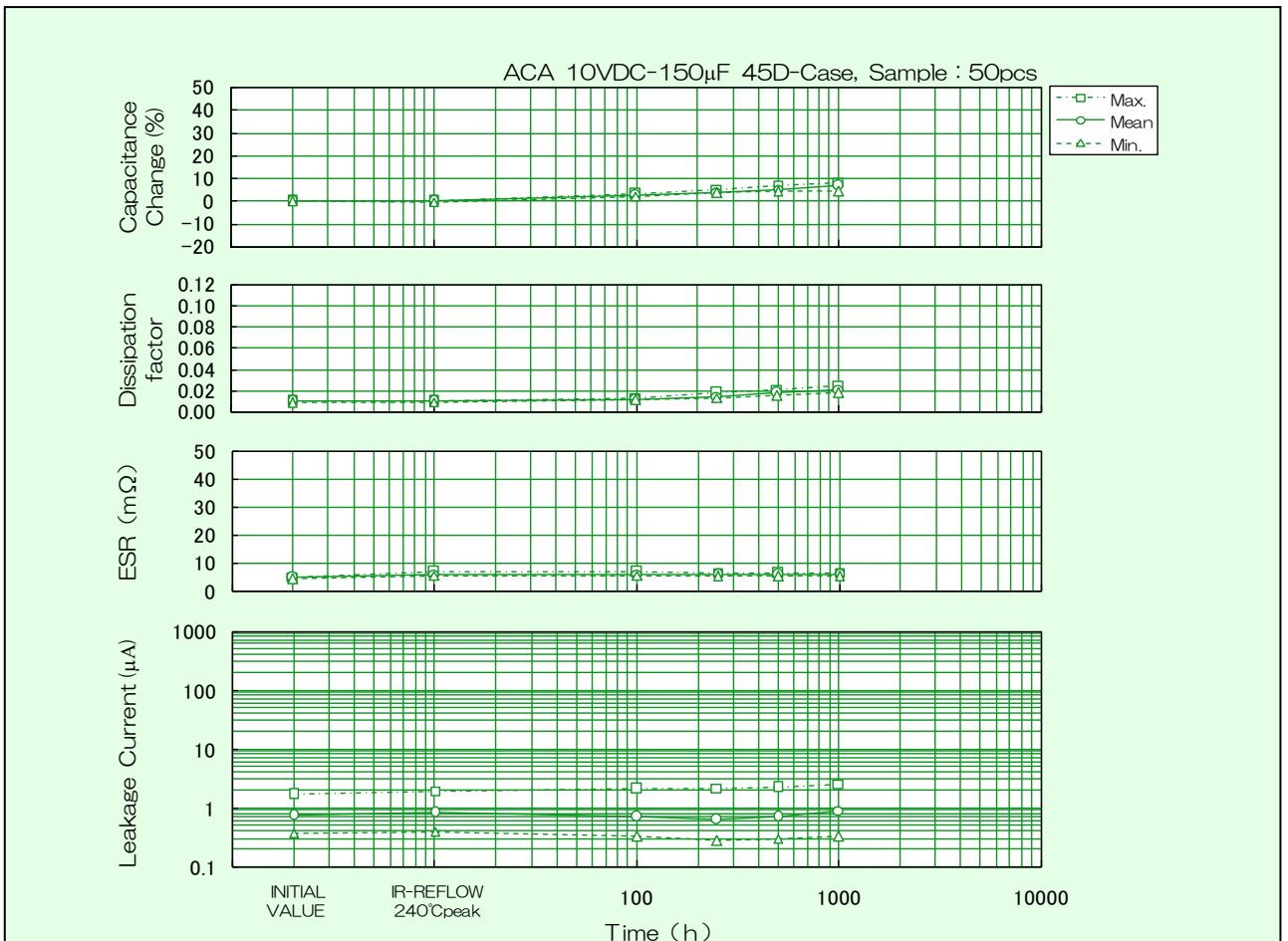
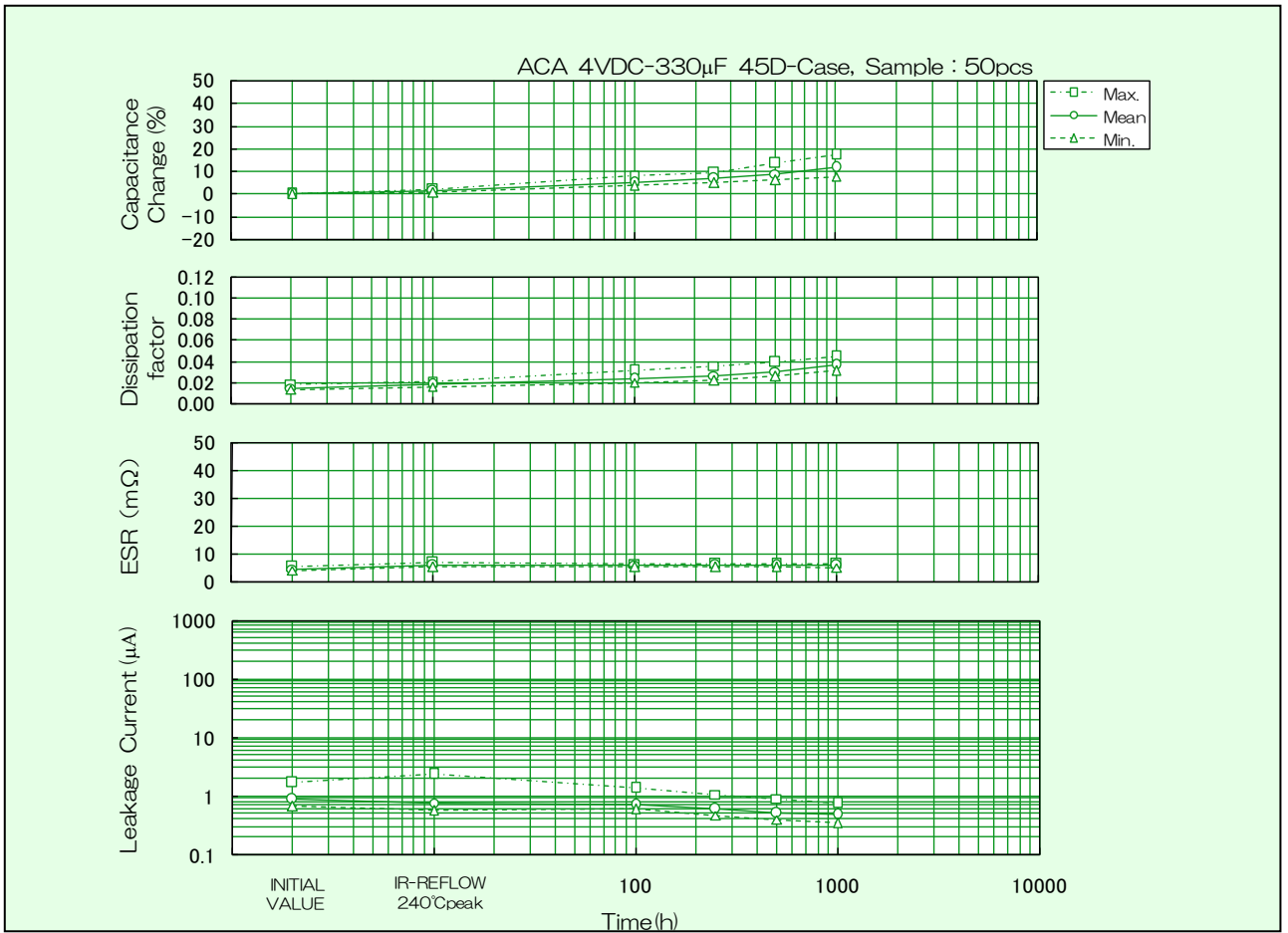
# CHARACTERISTICS AT HIGH AND LOW TEMPERATURE



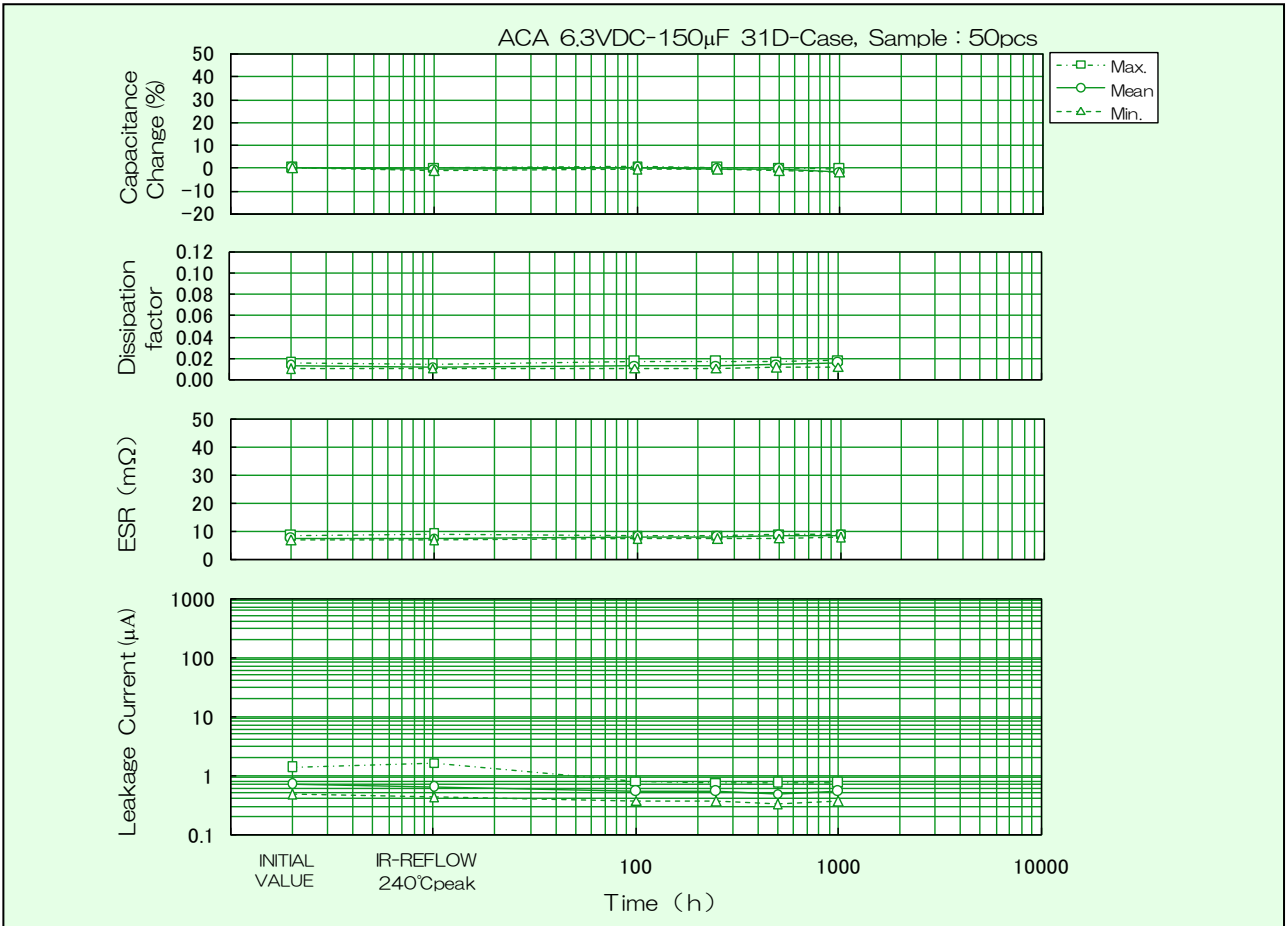
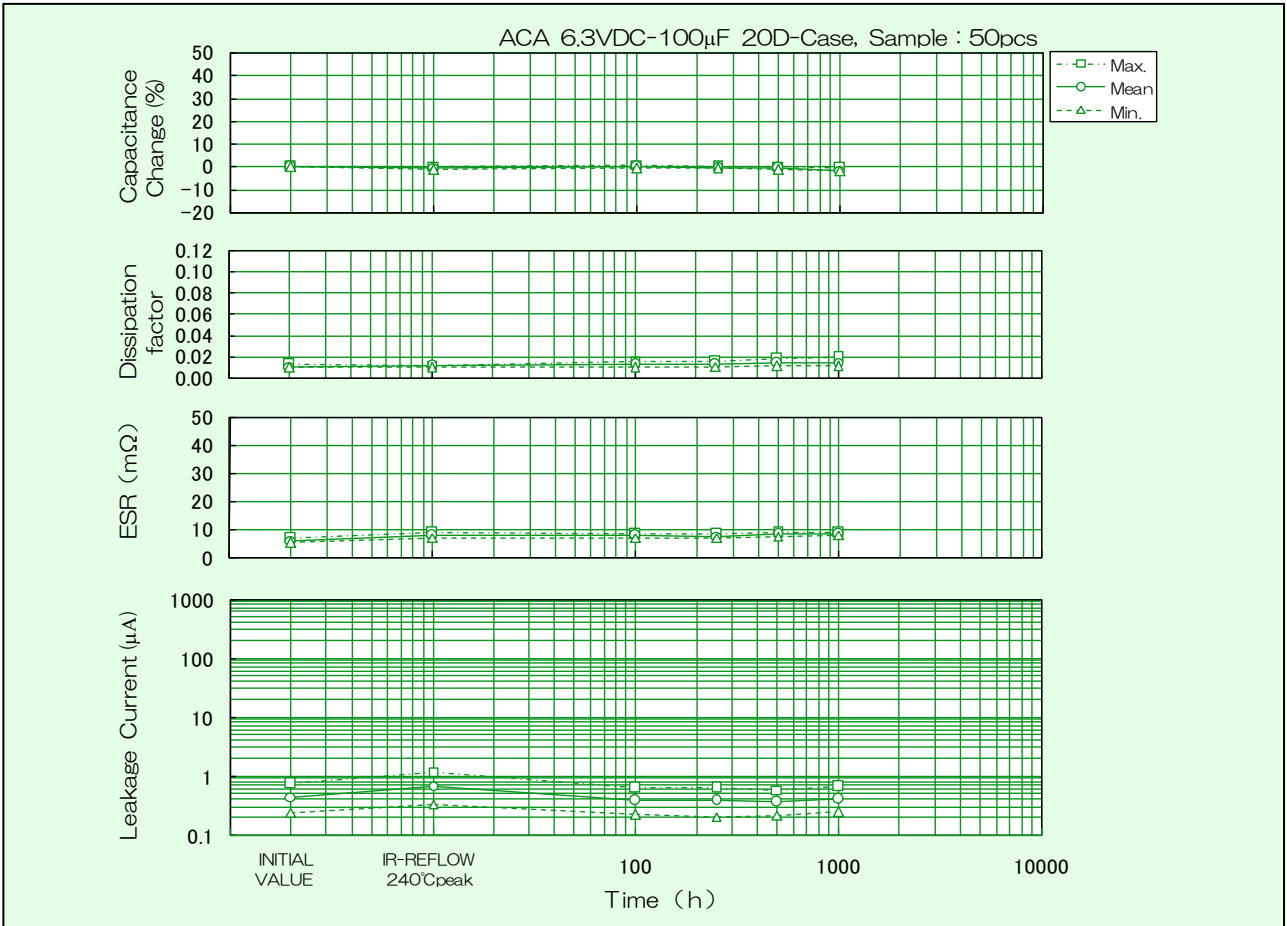


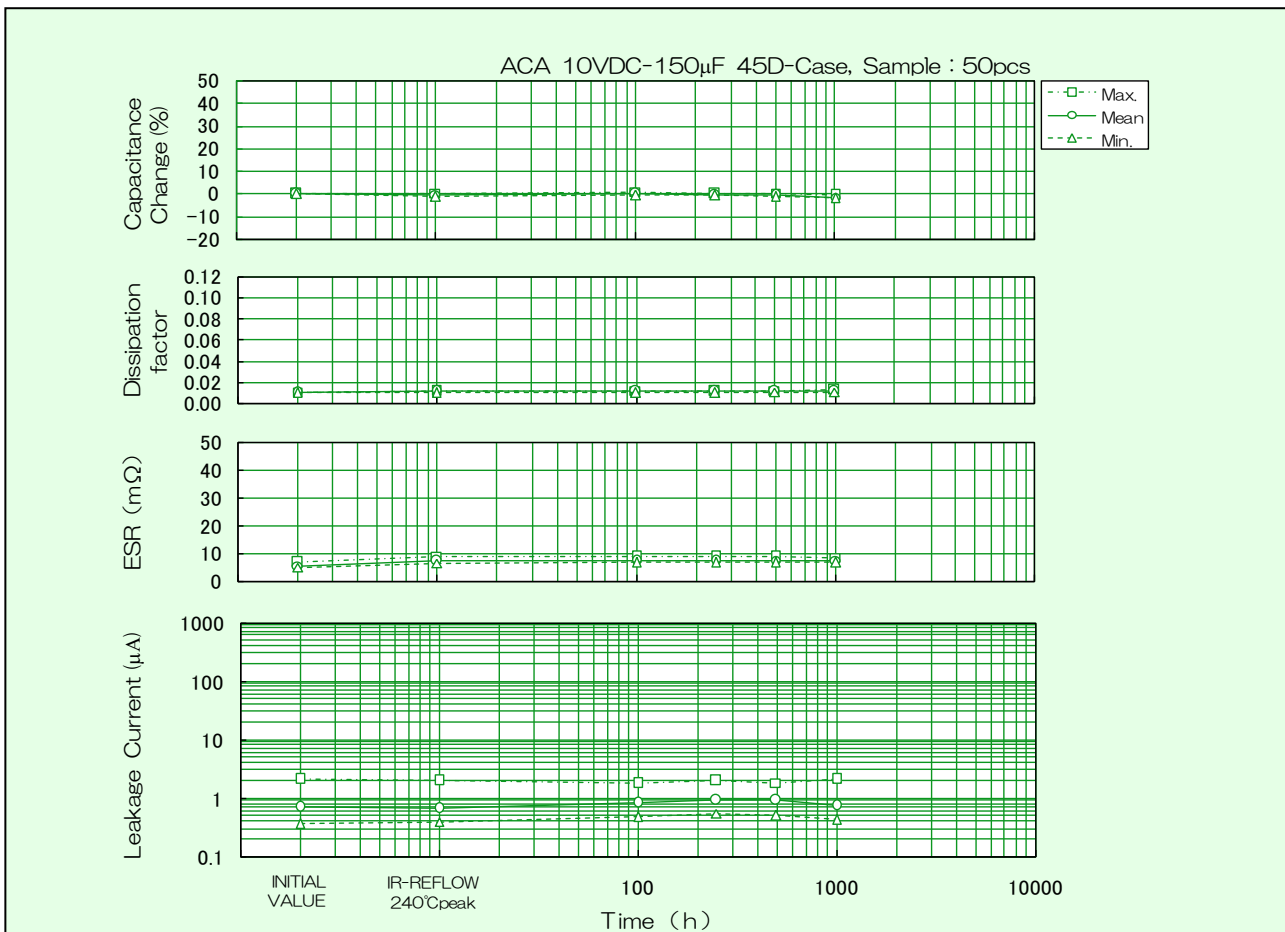
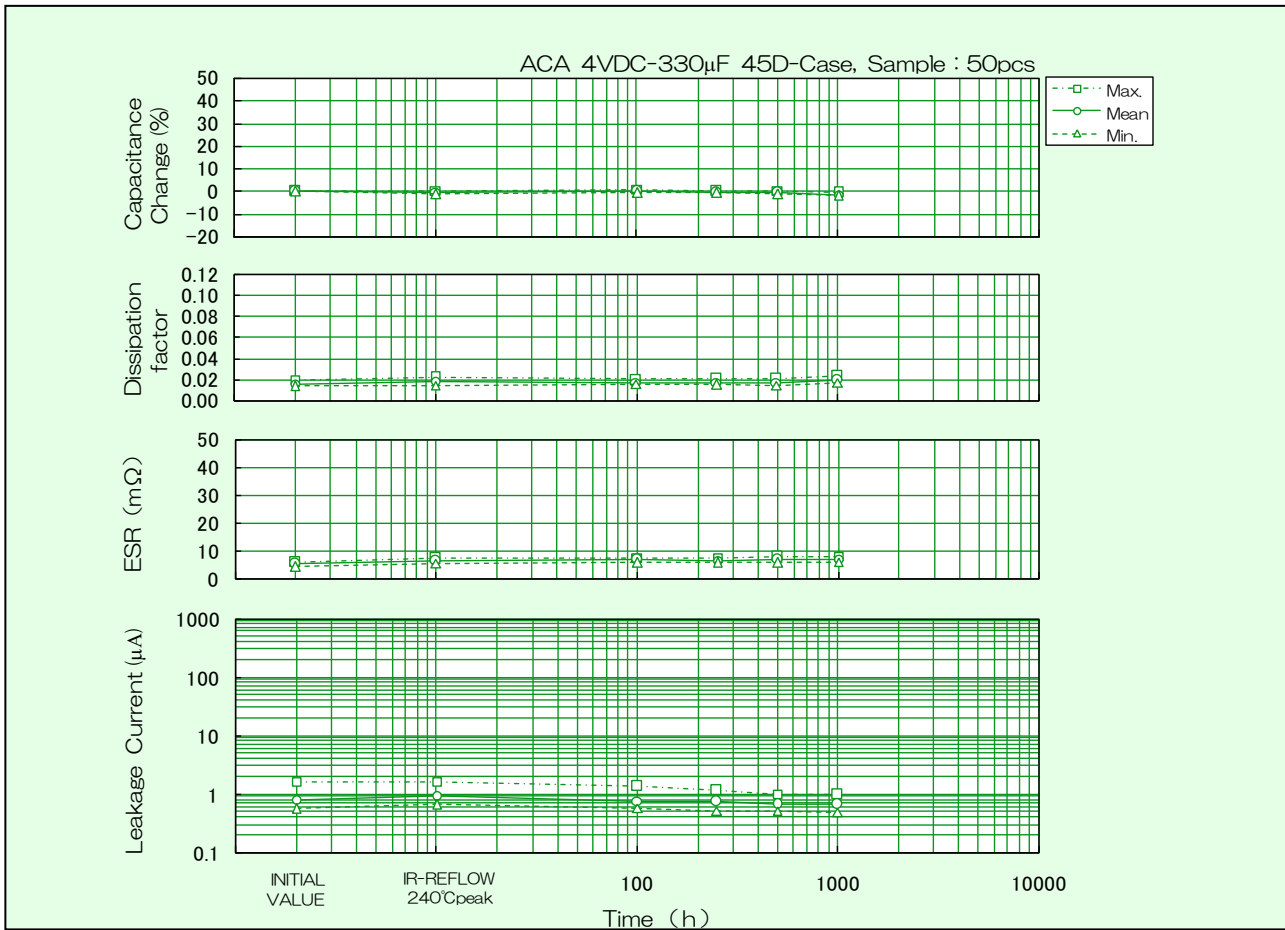
# HIGH TEMPERATURE / MOISTURE LOAD 60°C 90% RATED VOLTAGE





# ENDURANCE 105°C 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.

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

$$\text{Permissible ripple current } I_{max}=\sqrt{\frac{P_{max}}{ESR}} \text{ (A}_{rms}\text{)}$$

$$\text{Permissible ripple voltage } E_{max}=\sqrt{\frac{P_{max}}{ESR}} \times Z = I_{max} \times Z \text{ (V}_{rms}\text{)}$$

*I<sub>max</sub>* Permissible current at regulated frequency.

*E<sub>max</sub>* Permissible voltage at regulated frequency.

*P<sub>max</sub>* Permissible power less. (W)

*ESR* ESR value at regulated frequency. (Ω)

*Z* Impedance at regulated frequency. (Ω)

Permissible power loss for each case.

Case size	<i>P<sub>max</sub></i> ( 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 0.6<sup>l</sup> ceramic board-mounting and 0.8<sup>l</sup> 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<sup>2</sup>.
- (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.

Overseas Sales Dep. 5-3,3-Chome,Sennari-cho,Toyonaka-shi,Osaka 561-8558,Japan Tel : 06-6332-0883 Fax : 06-6332-0920

Head office 5-3,3-Chome,Sennari-cho,Toyonaka-shi,Osaka 561-8558,Japan Tel : 06-6332-0871 Fax : 06-6331-1386

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