No. P-ACA-003
DATE 2008-10

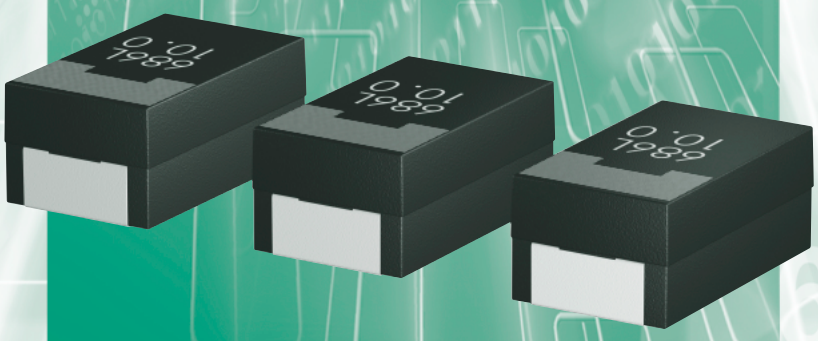
# PRODUCTS DATA SHEET

## Surface mount

# Aluminum Electrolytic Capacitor with Conductive Polymer Solid Electrolyte

RoHS COMPLIANT
LEAD FREE

**Type ACA**



MATSUO ELECTRIC CO., LTD.

## OUTLINE

Type ACA is an aluminum solid electrolytic capacitor which uses conductive polymer as cathode layer. In order to meet the 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, regulator peripherals.

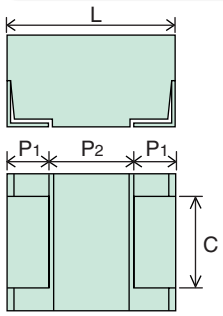
## FEATURES

1. Low ESR and Low impedance
   Using conductive polymer as cathode layer makes possible of lower ESR and impedance, 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 delating 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°C |
| Rated Temperature (Max. Operating Temp. at Rated Voltage) | +105°C |
| Rated Voltage | 2-2.5-4-6.3-8-10VDC |
| Capacitance | 10~470µF |
| Capacitance Tolerance | ±20% |

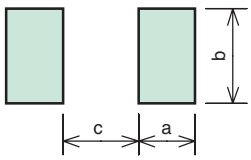
## DIMENSIONS




(mm)

| Case Size | L | W | T | P1±0.2 | P2 min. | C±0.2 |
|---|---|---|---|---|---|---|
| 4D | 7.3±0.2 | 4.3±0.2 | 1.9±0.1 | 1.3 | 4.1 | 2.4 |
| 6D | 7.3±0.2 | 4.3±0.2 | 2.8±0.3 | 1.3 | 4.1 | 2.4 |
| 8D | 7.3±0.3 | 4.3±0.3 | 4.2±0.3 | 1.3 | 4.0 | 2.4 |

## RECOMMENDED PAD DIMENSIONS

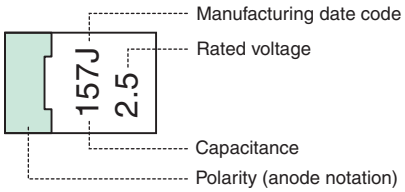



(mm)

| Case Size | EIA Code | a | b | c |
|---|---|---|---|---|
| 4D, 6D, 8D | 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




| Year | Month | Code | Year | Month | Code | Year | Month | Code | Year | Month | Code |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2005 2009 | 1 | A | 2006 2010 | 1 | N | 2007 2011 | 1 | a | 2008 2012 | 1 | n |
| | 2 | B | | 2 | P | | 2 | b | | 2 | p |
| | 3 | C | | 3 | Q | | 3 | c | | 3 | q |
| | 4 | D | | 4 | R | | 4 | d | | 4 | r |
| | 5 | E | | 5 | S | | 5 | e | | 5 | s |
| | 6 | F | | 6 | T | | 6 | f | | 6 | t |
| | 7 | G | | 7 | U | | 7 | g | | 7 | u |
| | 8 | H | | 8 | V | | 8 | h | | 8 | v |
| | 9 | J | | 9 | W | | 9 | j | | 9 | w |
| | 10 | K | | 10 | X | | 10 | k | | 10 | x |
| | 11 | L | | 11 | Y | | 11 | l | | 11 | y |
| | 12 | M | | 12 | Z | | 12 | m | | 12 | z |

## ORDERING INFORMATION

| ACA | 2001 | 107 | M | R | 4D | 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 |

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

| Capacitance Tolerance | Marking |
|---|---|
| ±20% | M |

| Code | Reel Size | Anode Notation |
|---|---|---|
| R | ϕ180 Reel | Feed hole: - |
| N | ϕ330 Reel | Feed hole: - |

| EIA Code | Case Code |
|---|---|
| 7343L | 4D |
| 7343 | 6D |
| 7343H | 8D |

## CATALOG NUMBERS AND RATING

**October, 2008**

**Table-1**

| Catalog number (1) | Rated Voltage (VDC) | Capacitance (μF) | Tolerance (±%) | Case Code | Lct. (μA) 20°C | Max. Dissipation Factor | ESR (mΩ) 100kHz | Max. Permissible Ripple (2) Current (Arms) 100kHz |
|---|---|---|---|---|---|---|---|---|
| ACA 2001 107 M_[1] 4D 0016 | 2 | 100 | 20 | 4D | 12.0 | 0.06 | 16 | 2.1 |
| ACA 2001 157 M_[1] 4D 0009 | ↓ | 150 | ↓ | ↓ | 18.0 | ↓ | 9 | 2.8 |
| ACA 2001 227 M_[1] 4D 0009 | ↓ | 220 | ↓ | ↓ | 26.4 | ↓ | ↓ | ↓ |
| ACA 2001 227 M_[1] 4D 0015 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 15 | 2.2 |
| ACA 2001 227 M_[1] 6D 0009 | ↓ | ↓ | ↓ | 6D | ↓ | ↓ | 9 | 3.1 |
| ACA 2001 227 M_[1] 6D 0015 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 15 | 2.4 |
| ACA 2001 337 M_[1] 6D 0007 | ↓ | 330 | ↓ | ↓ | 39.6 | ↓ | 7 | 3.5 |
| ACA 2001 337 M_[1] 6D 0012 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 12 | 2.7 |
| ACA 2001 397 MN 8D 0007 | ↓ | 390 | ↓ | 8D | 46.8 | ↓ | 7 | 3.8 |
| ACA 2001 477 MN 8D 0007 | ↓ | 470 | ↓ | ↓ | 56.4 | ↓ | ↓ | ↓ |
| ACA 2001 477 MN 8D 0010 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 10 | 3.2 |
| ACA 2501 826 M_[1] 4D 0018 | 2.5 | 82 | 20 | 4D | 12.3 | 0.06 | 18 | 2.0 |
| ACA 2501 107 M_[1] 4D 0015 | ↓ | 100 | ↓ | ↓ | 15.0 | ↓ | 15 | 2.2 |
| ACA 2501 157 M_[1] 6D 0015 | ↓ | 150 | ↓ | 6D | 22.5 | ↓ | ↓ | 2.4 |
| ACA 2501 187 M_[1] 6D 0015 | ↓ | 180 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| ACA 2501 187 MN 8D 0015 | ↓ | ↓ | ↓ | 8D | 27.0 | ↓ | ↓ | 2.6 |
| ACA 2501 227 MN 8D 0010 | ↓ | 220 | ↓ | ↓ | 33.0 | ↓ | 10 | 3.2 |
| ACA 2501 277 MN 8D 0010 | ↓ | 270 | ↓ | ↓ | 27.0 | ↓ | ↓ | ↓ |
| ACA 2501 337 MN 8D 0010 | ↓ | 330 | ↓ | ↓ | 33.0 | ↓ | ↓ | ↓ |
| ACA 4001 686 M_[1] 4D 0018 | 4 | 68 | 20 | 4D | 16.3 | 0.06 | 18 | 2.0 |
| ACA 4001 826 M_[1] 4D 0018 | ↓ | 82 | ↓ | ↓ | 19.7 | ↓ | ↓ | ↓ |
| ACA 4001 826 M_[1] 4D 0028 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 28 | 1.6 |
| ACA 4001 107 M_[1] 4D 0015 | ↓ | 100 | ↓ | ↓ | 24.0 | ↓ | 15 | 2.2 |
| ACA 4001 157 M_[1] 6D 0015 | ↓ | 150 | ↓ | 6D | 36.0 | ↓ | ↓ | 2.4 |
| ACA 4001 187 M_[1] 6D 0015 | ↓ | 180 | ↓ | ↓ | 43.2 | ↓ | ↓ | ↓ |
| ACA 4001 187 MN 8D 0010 | ↓ | ↓ | ↓ | 8D | ↓ | ↓ | 10 | 3.2 |
| ACA 4001 187 MN 8D 0015 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 15 | 2.6 |
| ACA 4001 227 MN 8D 0010 | ↓ | 220 | ↓ | ↓ | 52.8 | ↓ | 10 | 3.2 |
| ACA 4001 227 MN 8D 0015 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 15 | 2.6 |
| ACA 4001 277 MN 8D 0010 | ↓ | 270 | ↓ | ↓ | 64.8 | ↓ | 10 | 3.2 |
| ACA 4001 337 MN 8D 0010 | ↓ | 330 | ↓ | ↓ | 79.2 | ↓ | ↓ | ↓ |
| ACA 6301 106 M_[1] 4D 0055 | 6.3 | 10 | 20 | 4D | 2.52 | 0.06 | 55 | 1.1 |
| ACA 6301 226 M_[1] 4D 0045 | ↓ | 22 | ↓ | ↓ | 5.54 | ↓ | 45 | 1.3 |
| ACA 6301 336 M_[1] 4D 0025 | ↓ | 33 | ↓ | ↓ | 8.32 | ↓ | 25 | 1.7 |
| ACA 6301 476 M_[1] 4D 0025 | ↓ | 47 | ↓ | ↓ | 11.8 | ↓ | ↓ | ↓ |
| ACA 6301 566 M_[1] 4D 0025 | ↓ | 56 | ↓ | ↓ | 14.1 | ↓ | ↓ | ↓ |
| ACA 6301 686 M_[1] 4D 0015 | ↓ | 68 | ↓ | ↓ | 17.1 | ↓ | 15 | 2.2 |
| ACA 6301 686 M_[1] 4D 0025 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 25 | 1.7 |
| ACA 6301 107 M_[1] 4D 0015 | ↓ | 100 | ↓ | ↓ | 25.2 | ↓ | 15 | 2.2 |
| ACA 6301 107 M_[1] 6D 0018 | ↓ | ↓ | ↓ | 6D | ↓ | ↓ | 18 | ↓ |
| ACA 6301 157 M_[1] 6D 0010 | ↓ | 150 | ↓ | ↓ | 37.8 | ↓ | 10 | 2.9 |
| ACA 6301 157 M_[1] 6D 0015 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 15 | 2.4 |
| ACA 6301 157 MN 8D 0015 | ↓ | ↓ | ↓ | 8D | ↓ | ↓ | ↓ | 2.6 |
| ACA 6301 187 MN 8D 0010 | ↓ | 180 | ↓ | ↓ | 45.4 | ↓ | 10 | 3.2 |
| ACA 6301 337 MN 8D 0009 | ↓ | 330 | ↓ | ↓ | 83.2 | ↓ | 9 | 3.4 |
| ACA 8001 226 M_[1] 4D 0045 | 8 | 22 | 20 | 4D | 7.04 | 0.06 | 45 | 1.3 |
| ACA 8001 336 M_[1] 4D 0025 | ↓ | 33 | ↓ | ↓ | 10.6 | ↓ | 25 | 1.7 |
| ACA 8001 686 M_[1] 6D 0015 | ↓ | 68 | ↓ | 6D | 21.8 | ↓ | 15 | 2.4 |
| ACA 8001 107 MN 8D 0010 | ↓ | 100 | ↓ | 8D | 32.0 | ↓ | 10 | 3.2 |
| ACA 8001 157 MN 8D 0010 | ↓ | 150 | ↓ | ↓ | 48.0 | ↓ | ↓ | ↓ |
| ACA 1002 336 M_[1] 4D 0025 | 10 | 33 | 20 | 4D | 13.2 | 0.06 | 25 | 1.7 |
| ACA 1002 686 M_[1] 6D 0015 | ↓ | 68 | ↓ | 6D | 27.2 | ↓ | 15 | 2.4 |
| ACA 1002 107 MN 8D 0010 | ↓ | 100 | ↓ | 8D | 40.0 | ↓ | 10 | 3.2 |
| ACA 1002 107 MN 8D 0015 | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | 15 | 2.6 |
| ACA 1002 157 MN 8D 0010 | ↓ | 150 | ↓ | ↓ | 60.0 | ↓ | 10 | 3.2 |

(1) _[1] : No code for single item. “R” or “N” for taping specification.
(2) Reference value.

## STANDARD RATING

**October, 2008**

| R.V.(VDC) / Cap.(μF) | 2 | 2.5 | 4 | 6.3 | 8 | 10 |
|---|---|---|---|---|---|---|
| 10 | | | | 4D | | |
| 15 | | | | | | |
| 22 | | | | 4D | 4D | |
| 33 | | | | 4D | 4D | 4D |
| 47 | | | | 4D | | |
| 56 | | | | 4D | | |

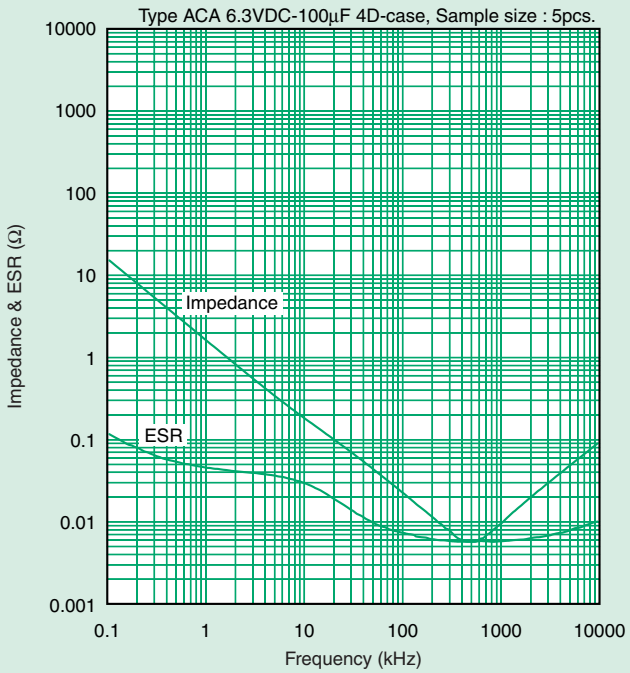
| R.V.(VDC) / Cap.(μF) | 2 | 2.5 | 4 | 6.3 | 8 | 10 |
|---|---|---|---|---|---|---|
| 68 | | | 4D | 4D | 6D | 6D |
| 82 | | 4D | 4D | | | |
| 100 | 4D | 4D | 4D | 4D,6D | 8D | 8D |
| 150 | 4D | 6D | 6D | 6D,8D | 8D | 8D |
| 180 | | 6D,8D | 6D,8D | 8D | | |
| 220 | 4D,6D | 8D | 8D | | | |

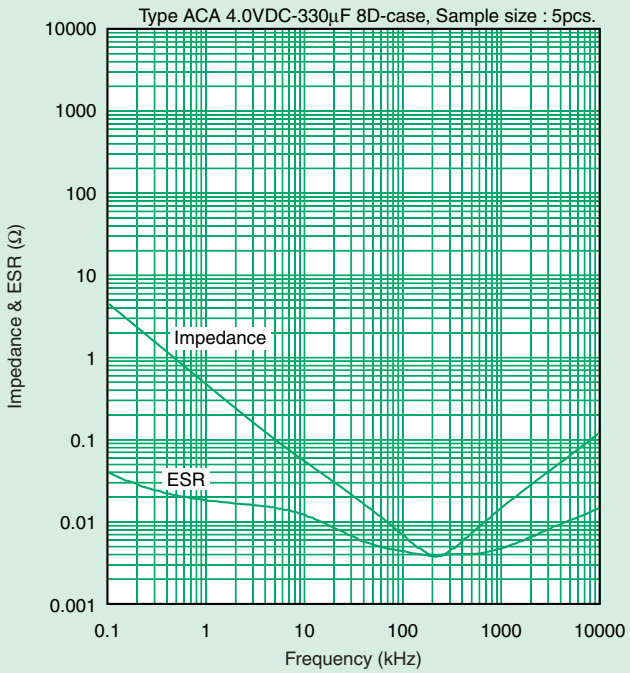
| R.V.(VDC) / Cap.(μF) | 2 | 2.5 | 4 | 6.3 | 8 | 10 |
|---|---|---|---|---|---|---|
| 270 | | 8D | 8D | | | |
| 330 | 6D | 8D | 8D | 8D | | |
| 390 | 8D | | | | | |
| 470 | 8D | | | | | |

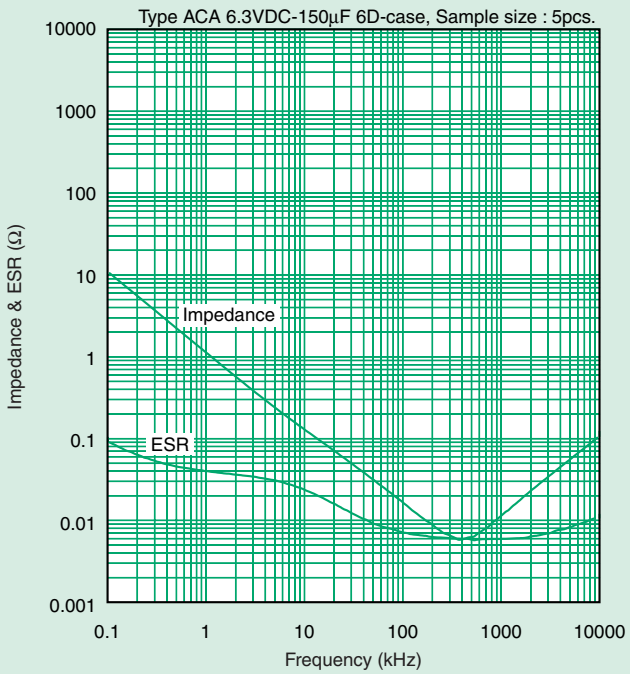
## PERFORMANCE

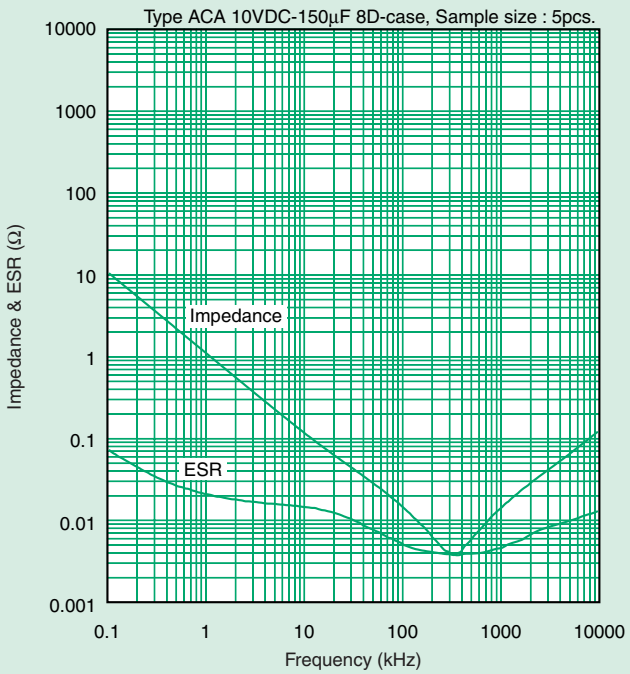
| No | Item | Performance | Test Method |
|---|---|---|---|
| 1 | Leakage Current (μA) | In case of less than 4R.V., Leakage Current is 0.06CV Max..<br>In case of more than 6.3R.V., Leakage Current is 0.04CV Max.. | JIS C 5101-1 4.9<br>Applied voltage: Rated voltage for 2 minutes through 1000Ω resistance. |
| 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.<br>Capacitance Change: Within ±10% of the value before the test<br>Dissipation Factor: Shall not exceed the value in No.3.<br>Visual Examination: There shall be no evidence of mechanical damage. | JIS C 5101-1 4.26<br>Temperature: 15~35°C<br>Surge voltage: Rated voltage(V) 2 2.5 4 6.3 8 10 / Surge voltage(V) 2.3 2.9 4.6 7.2 9.2 12<br>Protective resistance: 1000Ω |
| 7 | Shear (formerly adhesion) Test | No separation of terminal from solder. | JIS C 5101-1 4.34<br>Reflow Temperature: 240±10°C / Time: 10 seconds or less<br>Force: 5N<br>Duration: 5±1s |
| 8 | Substrate Bending Test | Capacitance: Initial value to remain steady during measurement.<br>Visual Examination: There shall be no evidence of damage. | JIS C 5101-1 4.35<br>Bending: 3mm |
| 9 | Vibration | Capacitance: Initial value to remain steady during measurement.<br>Visual Examination: There shall be no evidence of damage. | JIS C 5101-1 4.17<br>Frequency range: 10-55Hz Swing width: 1.5mm<br>Vibration direction: 3 directions with mutually right-angled<br>Duration: 2 hours in each of these mutually perpendicular directions (total 6 hours)<br>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<br>Peak acceleration: 490m/s$^2$<br>Duration: 11ms<br>Wave form: Half-sine |
| 11 | Solderability | Solder shall completely cover the terminal surface (there shall be no pin holes, nonwetting or solder repelling).<br>However, no plating edges of the terminal shall not be evaluated. | JIS C 5101-1 4.15<br>Solder temperature: 235±5°C<br>Dipping time: 5±0.5 seconds<br>Dipping depth: Terminal shall be dipped into melted solder |
| 12 | Resistance to Soldering Heat | Leakage Current: Shall not exceed the value in No.1.<br>Capacitance Change: Within ±10% of the value before the test<br>Dissipation Factor: Shall not exceed the value in No.3.<br>Visual Examination: There shall be no evidence of mechanical damage. | EIAJ RC-2460 4.6<br>IR reflow method<br>Preheat: 160±10°C 120±10s<br>Reflow: 230°C 25~30s<br>Peak 240°C max. |
| 13 | Rapid Change of Temperature | Leakage Current: Shall not exceed the value in No.1.<br>Capacitance Change: Within ±10% of the value before the test<br>Dissipation Factor: Shall not exceed the value in No.3.<br>Visual Examination: There shall be no evidence of mechanical damage. | JIS C5101-1 4.16<br>Step 1: -55±3°C 30±3 minutes<br>Step 2: 25 (-5/+10) °C, 3 minutes or less<br>Step 3: 105±2°C, 30±3 minutes<br>Step 4: 25 (-5/+10) °C, 3 minutes or less<br>Number of cycle: 5 |
| 14 | High Temperature / Moisture | Leakage Current: Shall not exceed 7.5 times the value in No.1.<br>Capacitance Change: Within $^{+50}_{-20}$% of the value before the test<br>Dissipation Factor: Shall not exceed two times the value in No.3.<br>Visual Examination: There shall be no evidence of mechanical damage. | JIS C5101-1 4.22<br>Temperature: 60±2°C<br>Moisture: 90~95%R.H.<br>Duration: 500 (-0/+24) hours |
| 15 | High Temperature / Moisture load | Leakage Current: Shall not exceed the value in No.1.<br>Capacitance Change: Within $^{+50}_{-20}$% of the value before the test<br>Dissipation Factor: Shall not exceed two times the value in No.3.<br>Visual Examination: There shall be no evidence of mechanical damage. | JIS C5101-1 4.22<br>Temperature: 60±2°C<br>Moisture: 90~95%R.H.<br>Applied voltage: Rated voltage<br>Duration: 1000 (-0/+48) hours |
| 16 | High Temperature Storage | Leakage Current: Shall not exceed the value in No.1.<br>Capacitance Change: Within ±10% of the value before the test<br>Dissipation Factor: Shall not exceed the value in No.3.<br>Visual Examination: There shall be no evidence of mechanical damage. | JIS C5101-1 4.25<br>Temperature: 105±2°C<br>Duration: 1000 (-0/+48) hours |
| 17 | Endurance | Leakage Current: Shall not exceed the value in No.1.<br>Capacitance Change: Within ±10% of the value before the test<br>Dissipation Factor: Shall not exceed the value in No.3.<br>Visual Examination: There shall be no evidence of mechanical damage. | JIS C5101-1 4.23<br>Temperature: 105±2°C<br>Applied voltage: Rated voltage<br>Duration: 1000 (-0/+48) hours |

## FREQUENCY CHARACTERISTICS

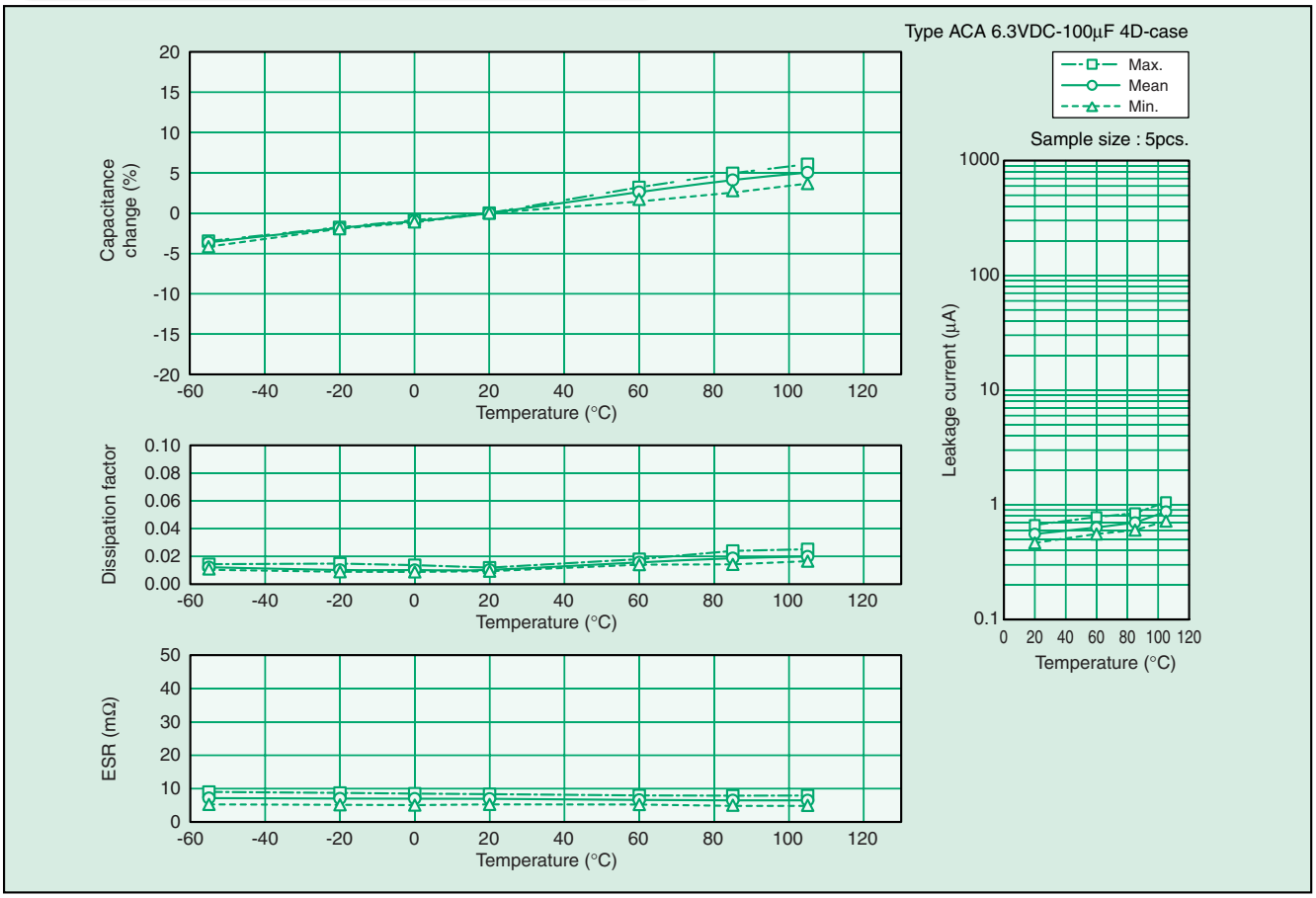


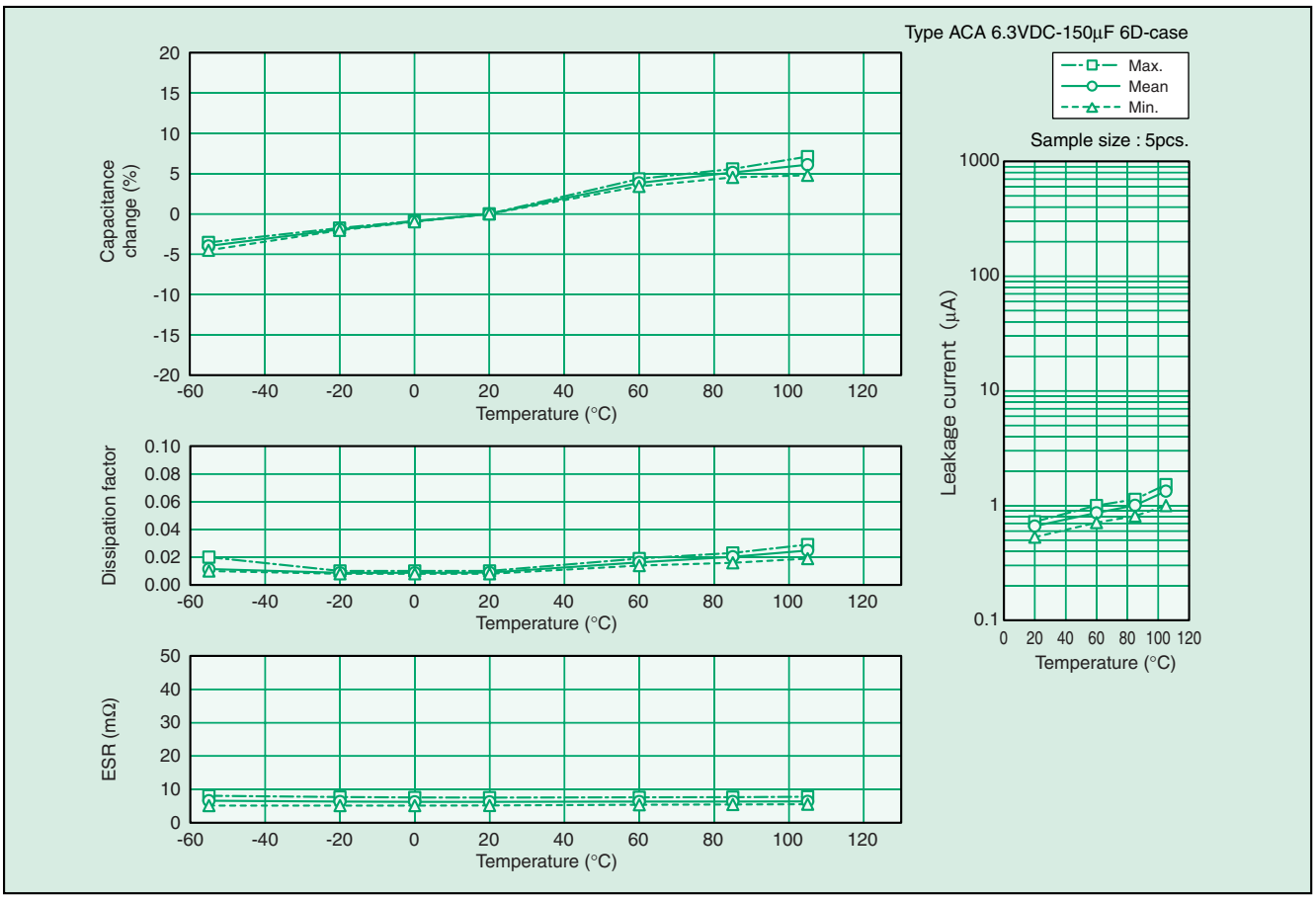



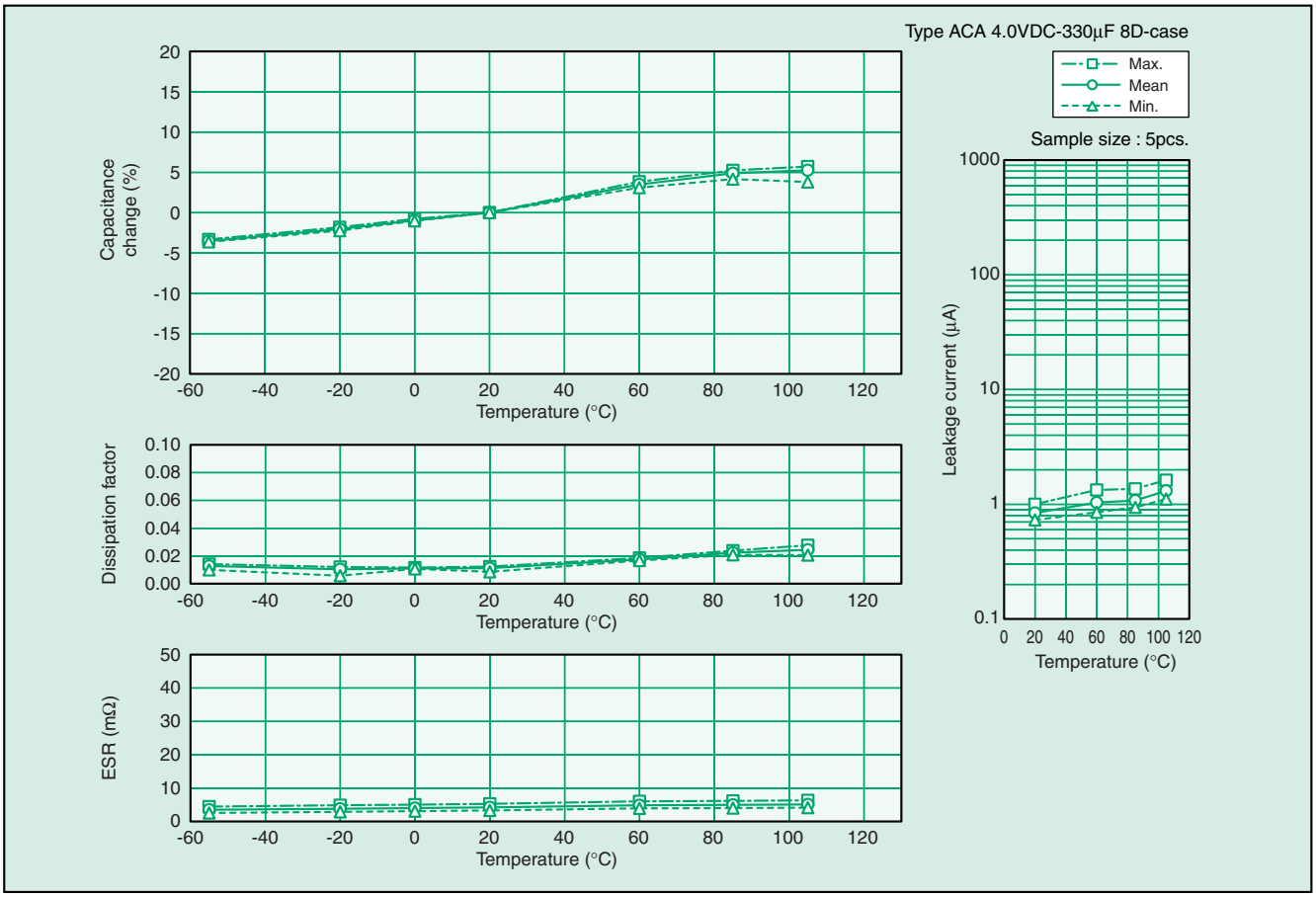



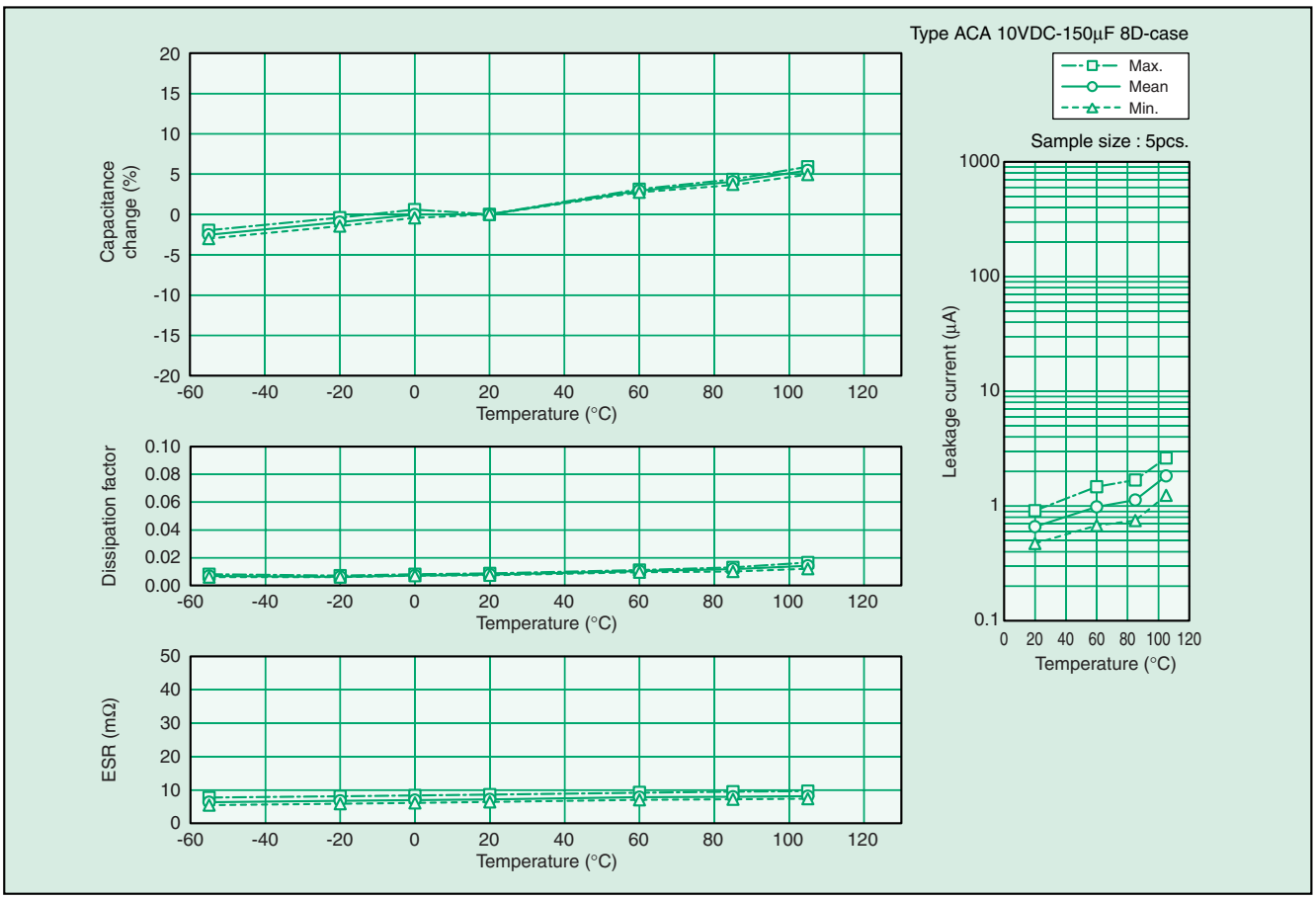



## CHARACTERISTICS AT HIGH AND LOW TEMPERATURE

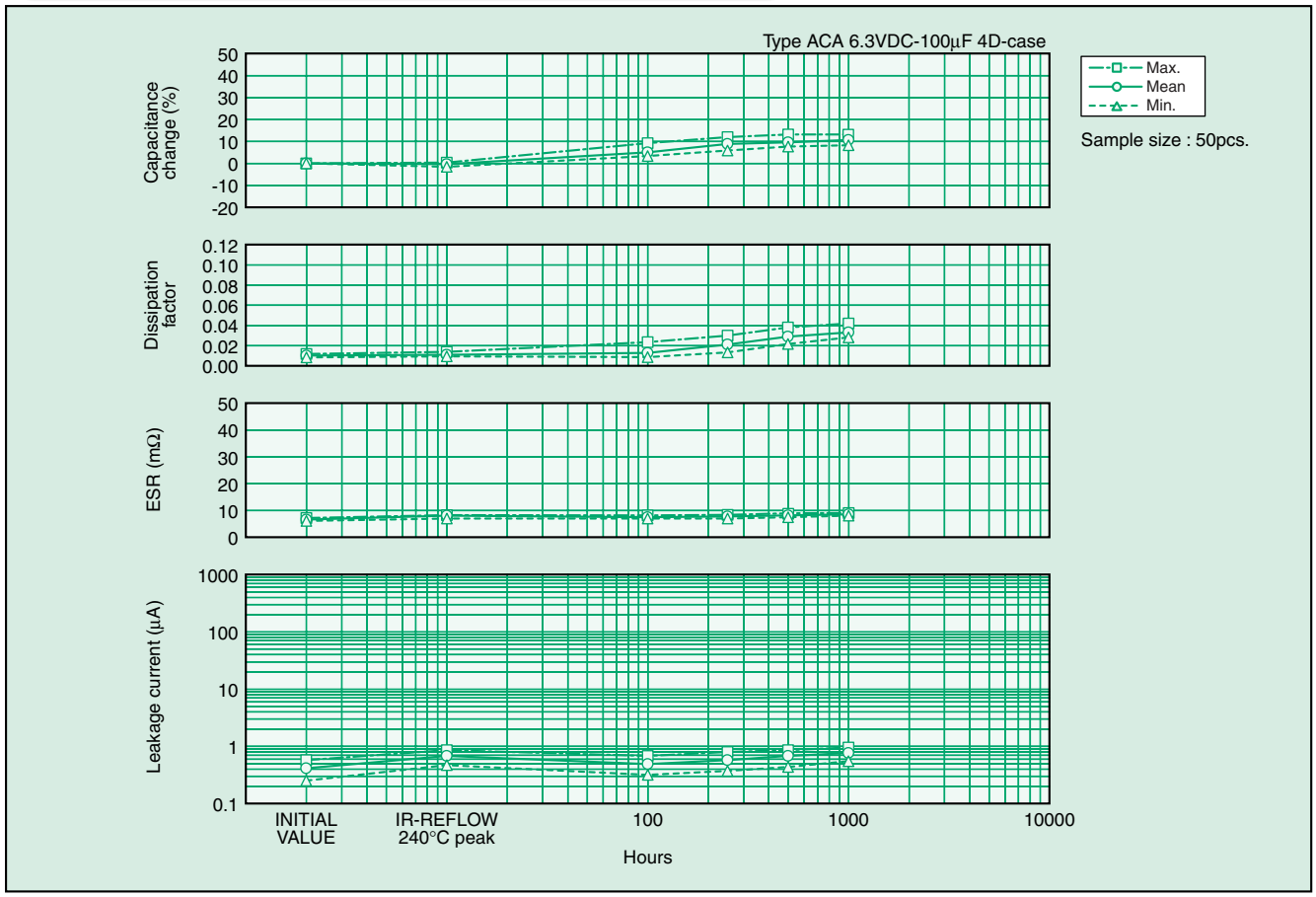


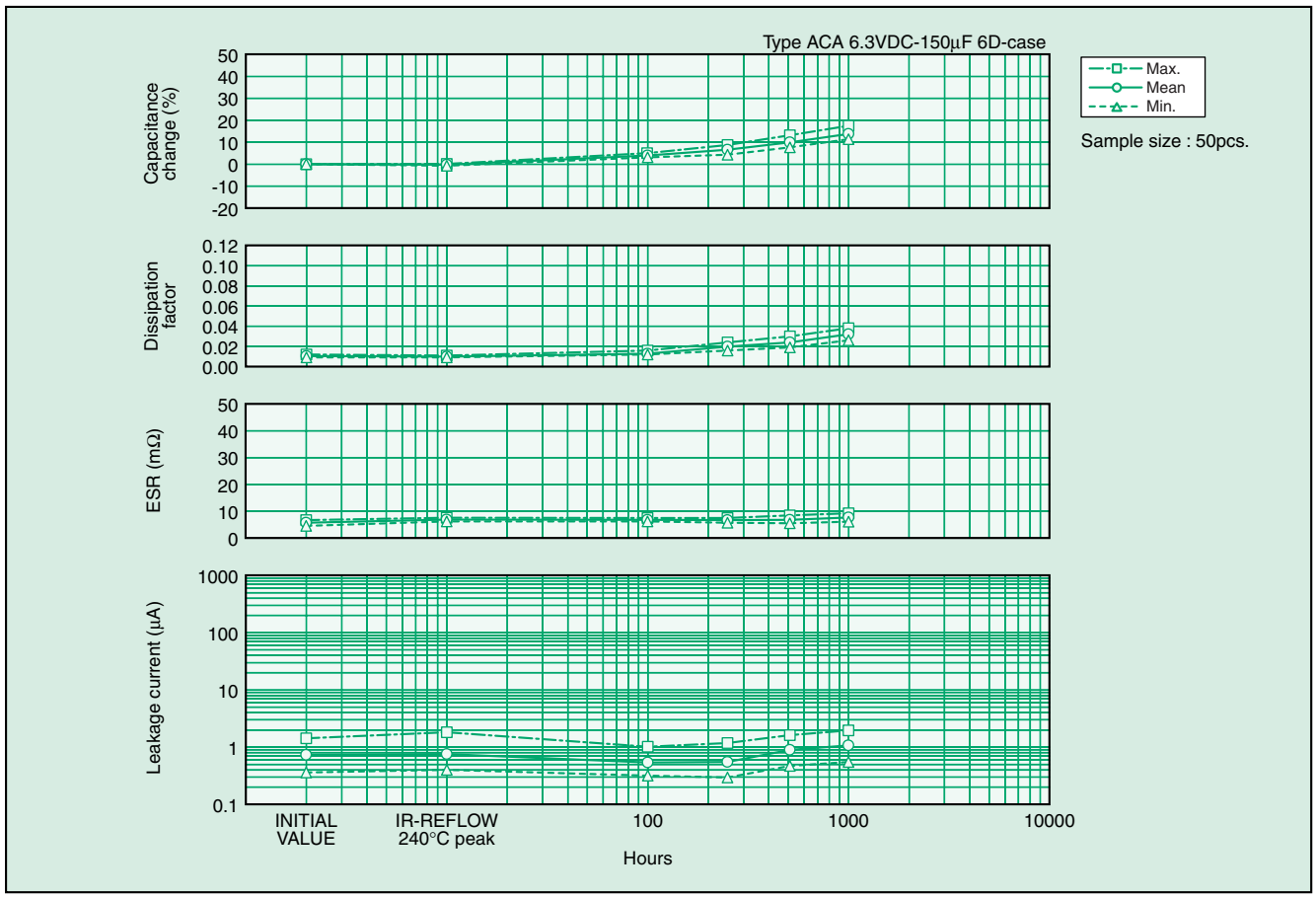



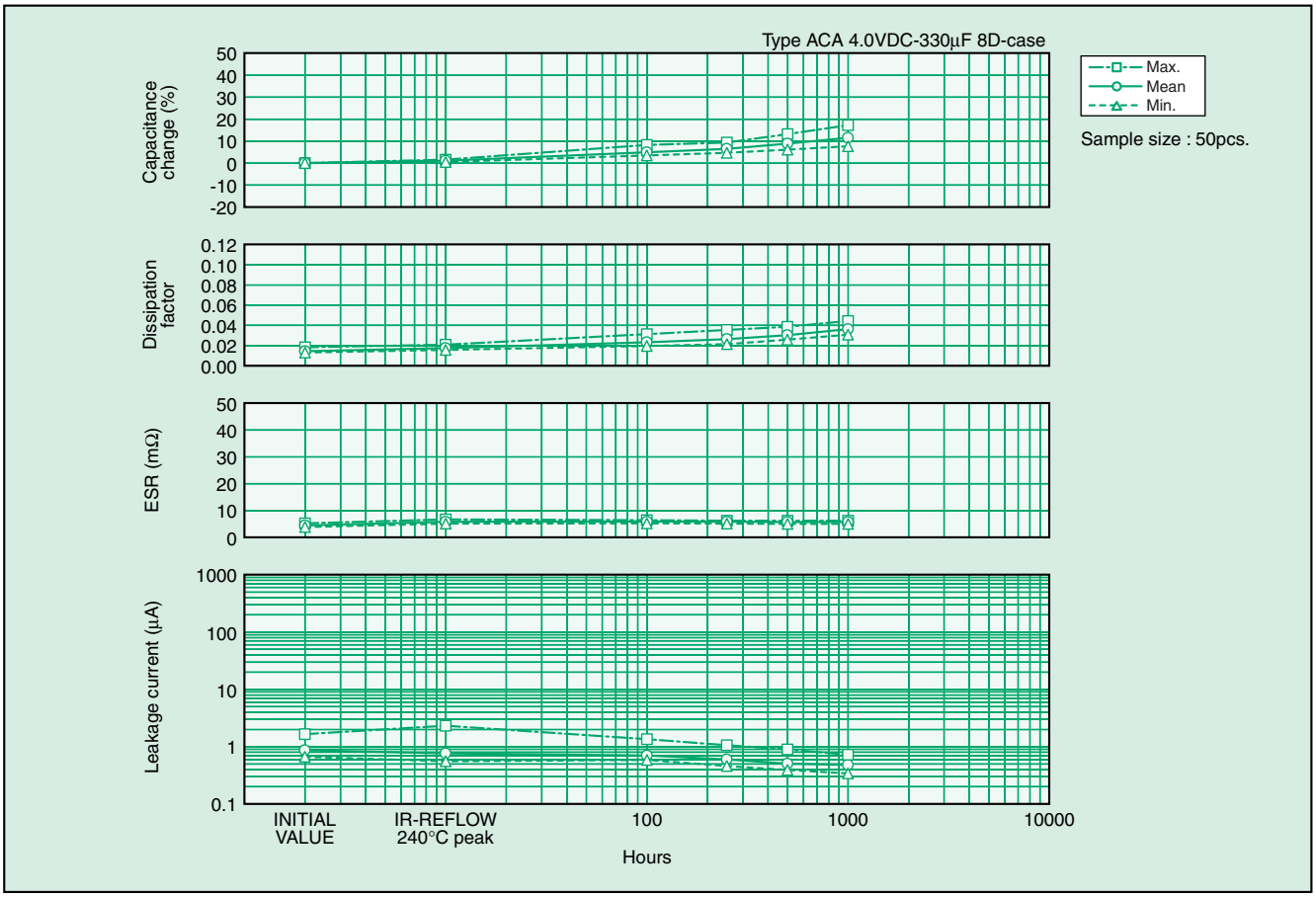

Type ACA 4.0VDC-330µF 8D-case
Max.
Mean
Min.
Sample size : 5pcs.
Capacitance change (%)
Dissipation factor
ESR (mΩ)
Leakage current (µA)
Temperature (°C)

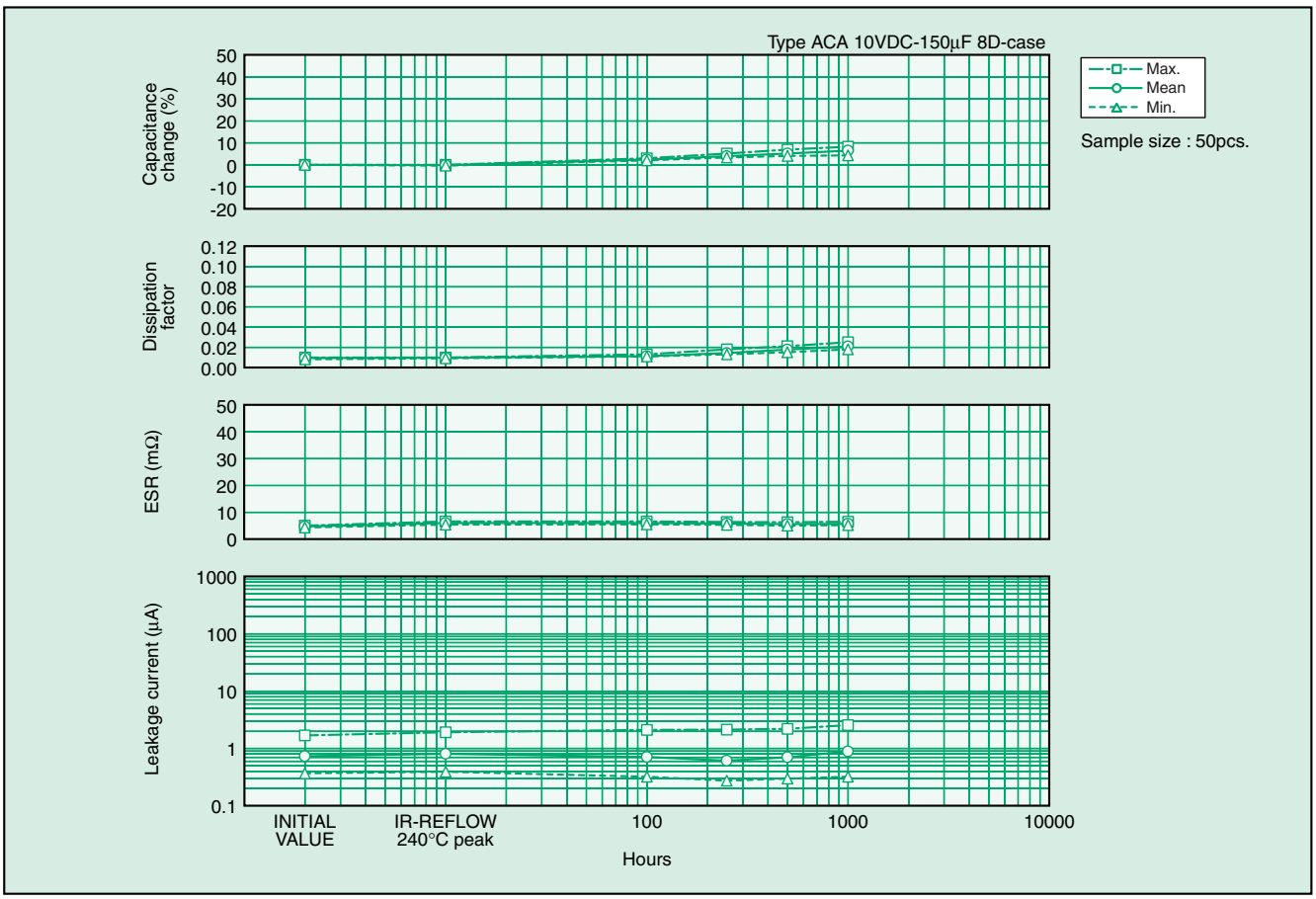

Type ACA 10VDC-150µF 8D-case
Max.
Mean
Min.
Sample size : 5pcs.
Capacitance change (%)
Dissipation factor
ESR (mΩ)
Leakage current (µA)
Temperature (°C)

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

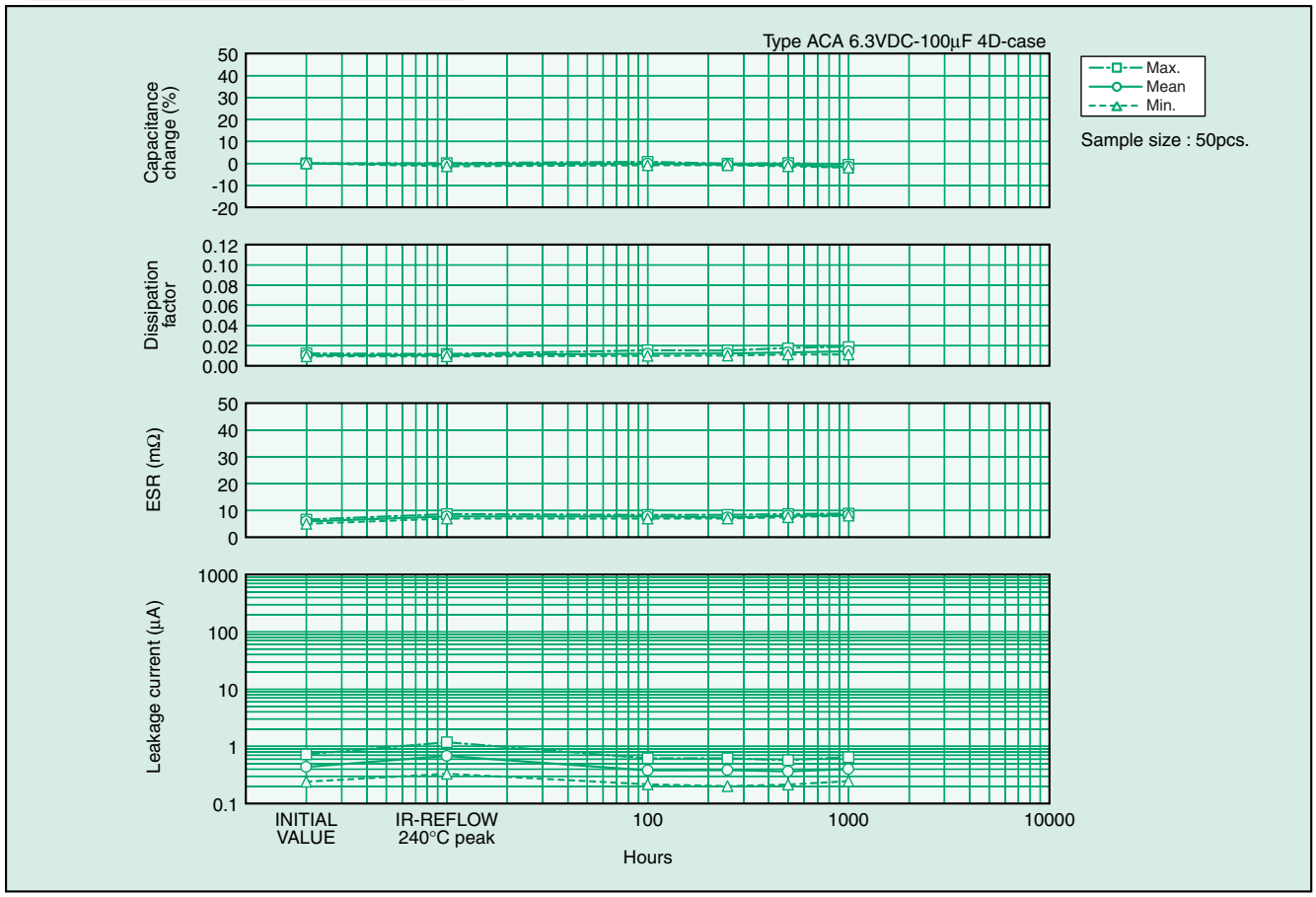


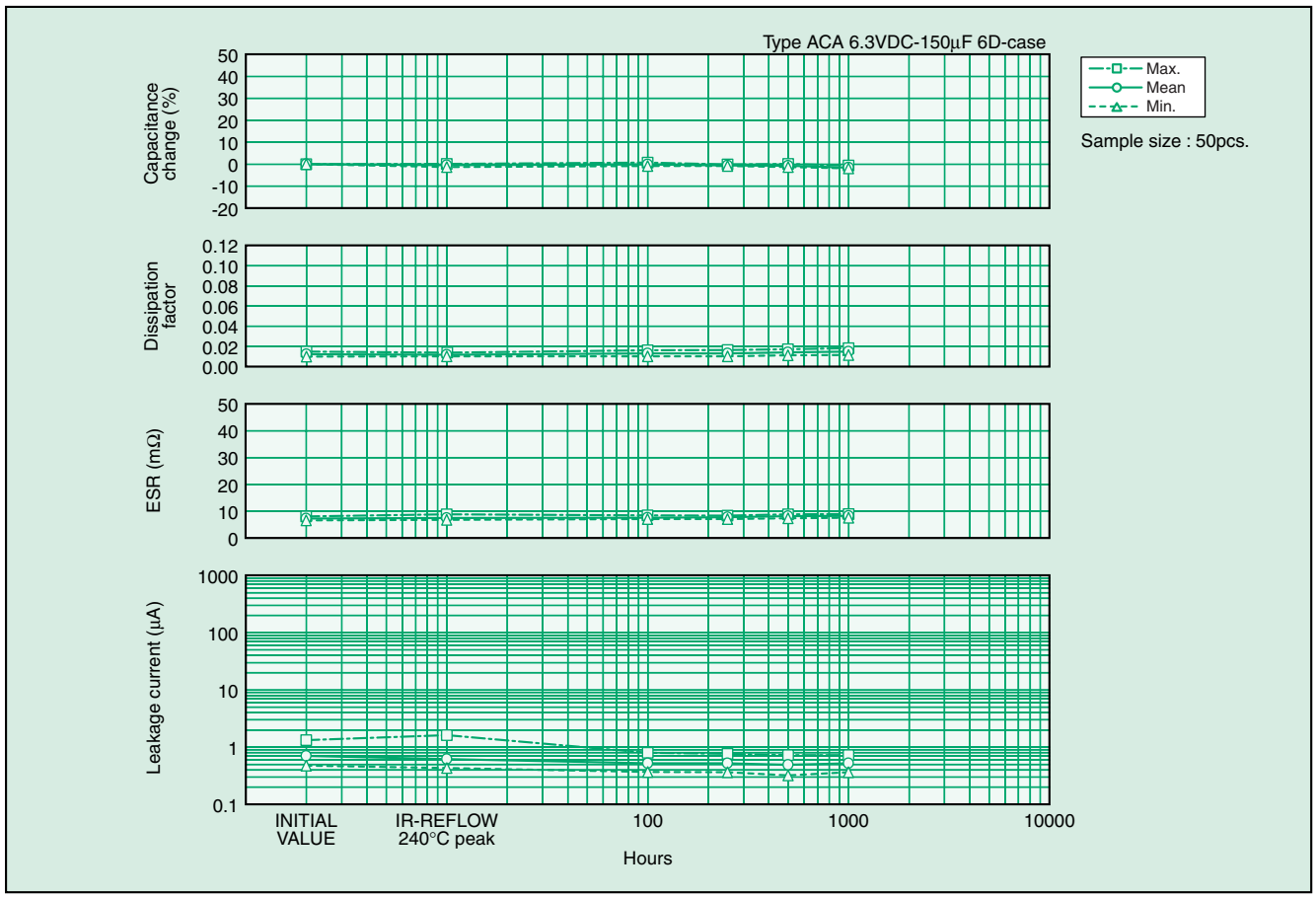



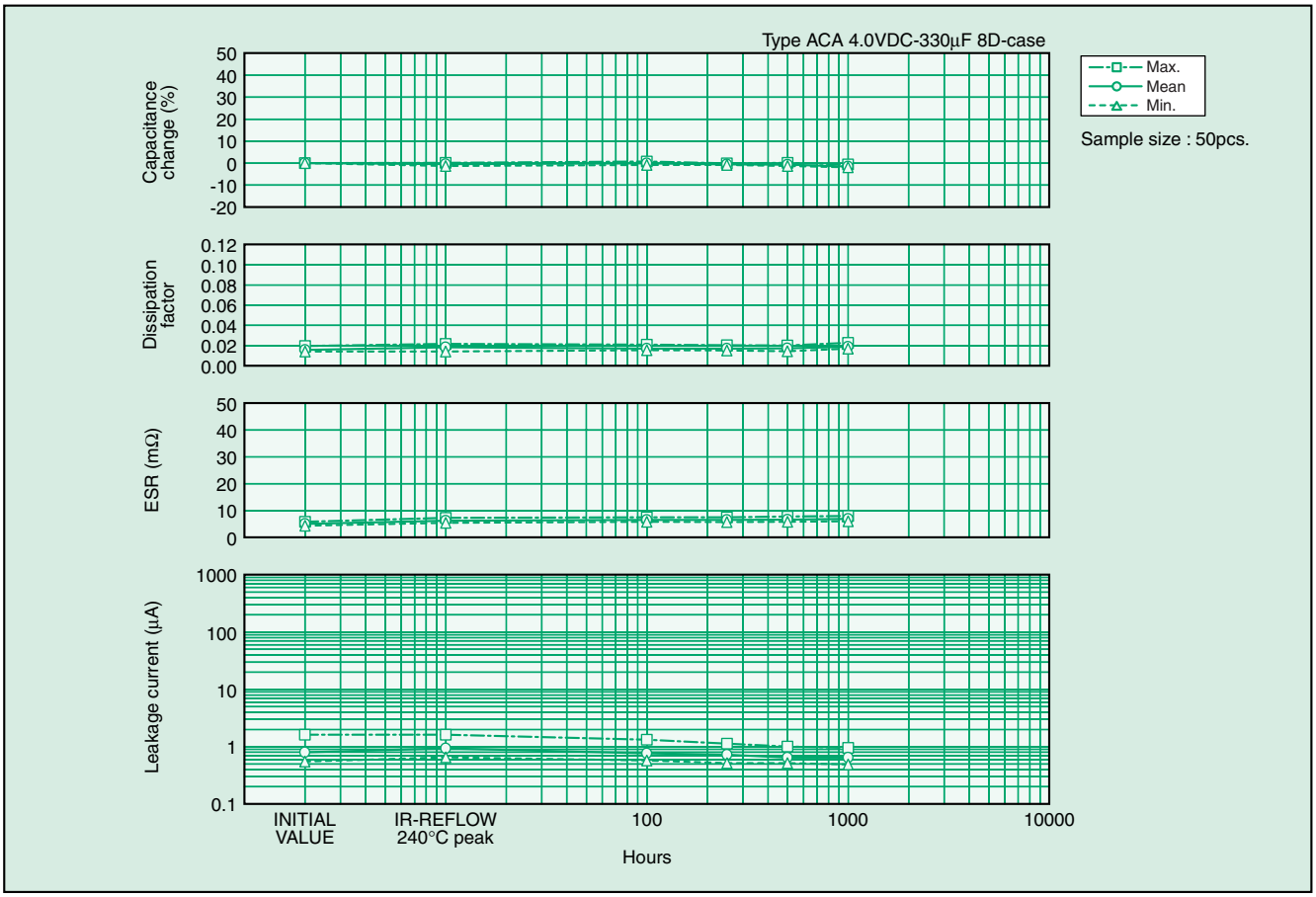

Type ACA 4.0VDC-330µF 8D-case
Max.
Mean
Min.
Sample size : 50pcs.
Capacitance change (%)
50
40
30
20
10
0
-10
-20
Dissipation factor
0.12
0.10
0.08
0.06
0.04
0.02
0.00
ESR (mΩ)
50
40
30
20
10
0
Leakage current (µA)
1000
100
10
1
0.1
INITIAL VALUE
IR-REFLOW 240°C peak
100
1000
10000
Hours

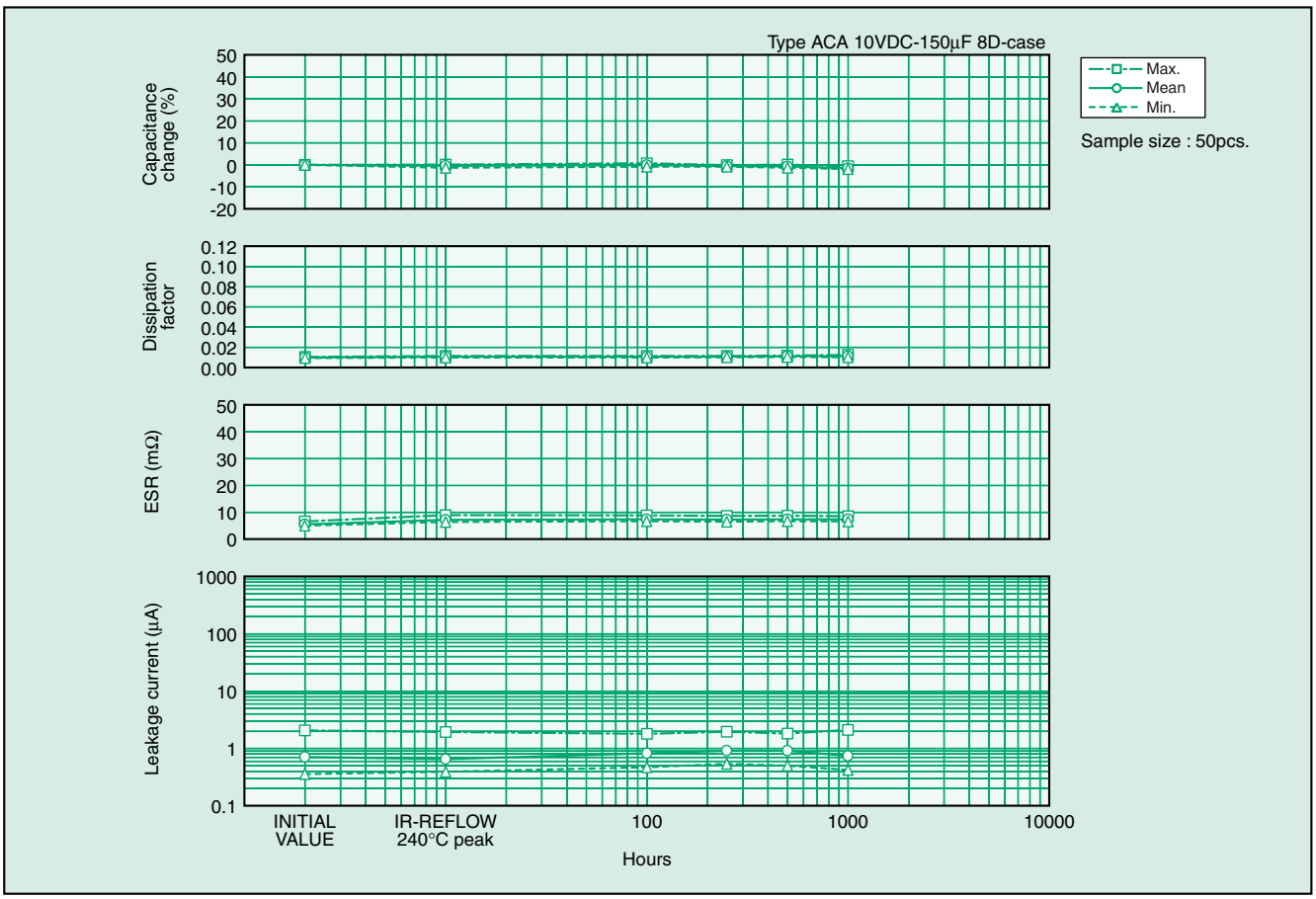

Type ACA 10VDC-150µF 8D-case
Max.
Mean
Min.
Sample size : 50pcs.
Capacitance change (%)
50
40
30
20
10
0
-10
-20
Dissipation factor
0.12
0.10
0.08
0.06
0.04
0.02
0.00
ESR (mΩ)
50
40
30
20
10
0
Leakage current (µA)
1000
100
10
1
0.1
INITIAL VALUE
IR-REFLOW 240°C peak
100
1000
10000
Hours

## ENDURANCE 105°C RATED VOLTAGE




Type ACA 4.0VDC-330µF 8D-case
Max.
Mean
Min.
Sample size : 50pcs.
Capacitance change (%)
50
40
30
20
10
0
-10
-20
Dissipation factor
0.12
0.10
0.08
0.06
0.04
0.02
0.00
ESR (mΩ)
50
40
30
20
10
0
Leakage current (µA)
1000
100
10
1
0.1
INITIAL VALUE
IR-REFLOW 240°C peak
100
1000
10000
Hours


Type ACA 10VDC-150µF 8D-case
Max.
Mean
Min.
Sample size : 50pcs.
Capacitance change (%)
50
40
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-20
Dissipation factor
0.12
0.10
0.08
0.06
0.04
0.02
0.00
ESR (mΩ)
50
40
30
20
10
0
Leakage current (µA)
1000
100
10
1
0.1
INITIAL VALUE
IR-REFLOW 240°C peak
100
1000
10000
Hours

# ■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 contain 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 Voltage
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 $I_{max}=\sqrt{\frac{P_{max}}{ESR}}\ (A_{rms})$

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

| | |
|---|---|
| $I_{max}$ | 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 | $P_{max}$ (watt) | |
|---|---|---|
| | Ceramic board | Glass epoxy board |
| 4D | 0.110 | 0.072 |
| 6D | 0.150 | 0.085 |
| 8D | 0.165 | 0.100 |

Note: Above values are measured at 0.6$^t$ ceramic board-mounting and 0.8$^t$ 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.

| | | | |
|---|---|---|---|
| Overseas Sales Dep. | 5-3, 3-Chome, Sennari-cho, Toyonaka-shi, Osaka 561-8558, Japan | Tel : 06-6332-0883 | Fax : 06-6332-0920 |
| USA | Matsuo Electronics of America, Inc.<br>2134 Main Street, Suite 200, Huntington Beach, CA 92648 | Tel : 714-969-2491 | Fax : 714-960-6492 |
| Head Office | 5-3, 3-Chome, Sennari-cho, Toyonaka-shi, Osaka 561-8558, Japan | Tel : 06-6332-0871 | Fax : 06-6331-1386 |
| URL | http://www.ncc-matsuo.co.jp/ | | |