

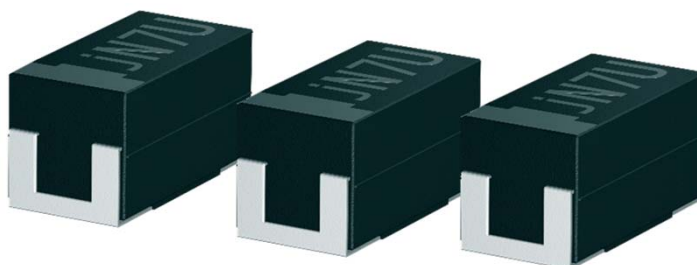
No. P-TCA-E017  
DATE 2025-04

# PRODUCTS DATA SHEET

## Tantalum Solid Electrolytic Capacitors with Conductive Polymer

Type TCA

RoHS COMPLIANT  
LEAD FREE



**MATSUO ELECTRIC CO., LTD.**

## OUTLINE (Type TCA)

Type TCA is a tantalum solid electrolytic capacitor which uses conductive polymer as cathode layer. Their equivalent series resistance (ESR) is extremely lowered with the characteristics of the polymer having high electric conductivity. This ensures higher permissible ripple current and excellent noise absorption performance on high-frequency circuits.

## APPLICATION

Mobile phones, digital cameras, high-performance portable equipments, personal computers, digital TV sets, DC/DC converters, regulators and peripherals.

## FEATURES

1. Low ESR and Low impedance  
Using a conductive polymer as cathode layer makes low ESR and impedance possible.  
Type TCA makes high permissible ripple current and is suitable for noise bypass application.
2. Stable ESR over temperature  
ESR is extremely stable from low temperature through high temperature.
3. Compact and Large capacitance  
The capacitor is smaller and has larger capacitance than ceramic capacitor and aluminum electrolytic capacitor.
4. Benign Failure Mode  
Type TCA offers very safe characteristics which makes ignition and smoking harder by taking advantages of characteristics of conductive polymer if the capacitor be short-circuited.
5. Lead Free and RoHS Compliant.

## APPLICATION CLASSIFICATION BY USE

The application classification by use which divided the market and use into four is set up supposing our products being used for a broad use. Please confirm the application classification by use of each product that you intend to use. Moreover, please be sure to inform to our Sales Department in advance in examination of the use of those other than the indicated use.

## RATINGS

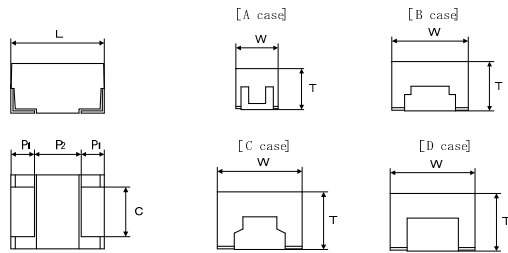
| Item                       | Ratings                                                                     |
|----------------------------|-----------------------------------------------------------------------------|
| Failure Rate Level         | 1% / 1000 h                                                                 |
| Category Temperature Range | -55 to +105°C (to be used at derated voltage when temperature exceeds 85°C) |
| Rated Voltage              | 2.5 - 4 - 6.3 - 10 VDC                                                      |
| Derated Voltage            | 2.0 - 3.2 - 5.0 - 8.0 VDC (105°C)                                           |
| Capacitance                | 22~680 $\mu$ F                                                              |
| Capacitance Tolerance      | $\pm 20$ % (M)                                                              |

## ORDERING INFORMATION

| TCA           |         | 6301          |         | 226         |         | M                     |         | R                       |                 | A         |           | 200                          |           |
|---------------|---------|---------------|---------|-------------|---------|-----------------------|---------|-------------------------|-----------------|-----------|-----------|------------------------------|-----------|
| TYPE          |         | RATED VOLTAGE |         | CAPACITANCE |         | CAPACITANCE TOLERANCE |         | STYLE OF REELED PACKAGE |                 | CASE CODE |           | ESR (m $\Omega$ )            |           |
| Rated Voltage | Marking | Capacitance   | Marking | Capacitance | Marking | Capacitance Tolerance | Marking | Anode Notation          | Reel Size       | Code      | Case Code | Height of component max.(mm) | Case Size |
| 2.5V          | 2501    | 22 $\mu$ F    | 226     | 100 $\mu$ F | 107     | $\pm 20\%$            | M       | Feed hole: -            | $\phi$ 180 Reel | R         | A         | 1.8                          | 3216      |
| 4V            | 4001    | 33 $\mu$ F    | 336     | 150 $\mu$ F | 157     |                       |         | Feed hole: -            | $\phi$ 330 Reel | N         | B         | 2.1                          | 3528      |
| 6.3V          | 6301    | 47 $\mu$ F    | 476     | 220 $\mu$ F | 227     |                       |         |                         |                 |           | C         | 2.7                          | 6032      |
| 10V           | 1002    | 68 $\mu$ F    | 686     | 330 $\mu$ F | 337     |                       |         |                         |                 |           | D         | 3.0                          | 7343      |
|               |         |               |         | 470 $\mu$ F | 477     |                       |         |                         |                 |           |           |                              |           |
|               |         |               |         | 680 $\mu$ F | 687     |                       |         |                         |                 |           |           |                              |           |

Note : For a capacitor with special requirements from customers, a 2-digit specific numbers will be added between the case code and the ESR for our product management.

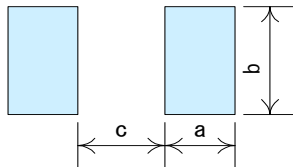
## DIMENSIONS



| Case Code | Case Size | L±0.2 | W±0.2 | T±0.2 | P <sub>1</sub> ±0.2 | P <sub>2</sub> min. | C±0.1 |
|-----------|-----------|-------|-------|-------|---------------------|---------------------|-------|
| A         | 3216      | 3.2   | 1.6   | 1.6   | 0.75                | 1.4                 | 1.2   |
| B         | 3528      | 3.5   | 2.8   | 1.9   | 0.8                 | 1.5                 | 2.2   |
| C         | 6032      | 6.0   | 3.2   | 2.5   | 1.3                 | 3.0                 | 2.2   |
| D         | 7343      | 7.3   | 4.4   | 2.8   | 1.3                 | 4.0                 | 2.4   |

Note : Dimension T of the case code "S" specifies max. value.

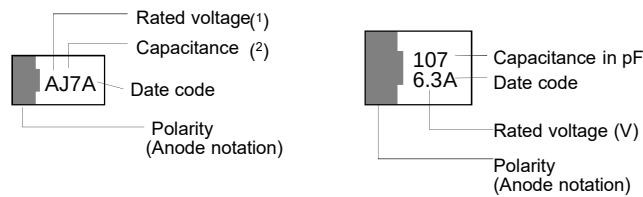
## RECOMMENDED PAD DIMENSIONS



| Case Code | a   | b   | c   |
|-----------|-----|-----|-----|
| A         | 2.0 | 1.5 | 1.5 |
| B         | 2.0 | 2.4 | 1.8 |
| C         | 2.4 | 2.5 | 3.3 |
| D         | 2.4 | 2.7 | 4.6 |

In order to expect the self alignment effect, it is recommended that the 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 (1) Rated voltage is described as shown below. (2) Capacitance is described as shown below.

| Rated Voltage(VDC) | Case A |
|--------------------|--------|
| 2.5                | e      |
| 4                  | g      |
| 6.3                | j      |
| 10                 | A      |

| Capacitance | Case A |
|-------------|--------|
| 22μF        | J7     |
| 33μF        | N7     |
| 47μF        | S7     |
| 68μF        | W7     |

## STANDRRARD RATING

April, 2025

| R.V.(VDC)<br>Cap.(mF) | 2.5           | 4               | 6.3               | 10         |
|-----------------------|---------------|-----------------|-------------------|------------|
| 10                    |               |                 |                   |            |
| 15                    |               |                 |                   |            |
| 22                    | A(180,200)    | A(180,200)      | A(180,200)        | A(180,200) |
| 33                    | A(180,200)    | A(180,200)      | A(180,200), B(80) | B(80)      |
| 47                    | A(180,200)    | A(180,200)      | B(70,35)          | B(70,35)   |
| 68                    | A(200), B(70) | B(70)           | B(70)             | C(45,60)   |
| 100                   | B(70,25)      | B(70,25)        | B(70,55,25)       |            |
| 150                   | B(70,25)      | B(70,25)        | B(25), C(40,60)   | D(40,55)   |
| 220                   | B(25)         | B(25), C(40,60) | B(25), D(40)      |            |
| 330                   |               |                 | D(40,55)          |            |
| 470                   |               | D(40,55)        |                   |            |
| 680                   | D(30)         |                 |                   |            |

The parenthesized values show ESR.(maximum values in mΩat 100kHz)

# CATALOG NUMBERS AND RATING

April, 2025

| Catalog number <sup>(1)</sup> ( <sup>2</sup> )  | Rated Voltage (VDC) | Capacitance (μF) | Tolerances (±%) | Case Code | Lct. (μA) |      |       | Max. Dissipation Factor |      |       | ESR (mΩ)<br>100 kHz | Max. permissible<br>Ripple Current <sup>(3)</sup><br>(mA rms)<br>100 kHz |
|-------------------------------------------------|---------------------|------------------|-----------------|-----------|-----------|------|-------|-------------------------|------|-------|---------------------|--------------------------------------------------------------------------|
|                                                 |                     |                  |                 |           | 20°C      | 85°C | 105°C | -55°C                   | 20°C | 105°C |                     |                                                                          |
| TCA 2501 226 M <sub>1</sub> A <sub>2</sub> 0200 | 2.5                 | 22               | 20              | A         | 5.50      | 55.0 | 55.0  | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 2501 226 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 22               | ↓               | A         | 5.50      | 55.0 | 55.0  | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 2501 336 M <sub>1</sub> A <sub>2</sub> 0200 | ↓                   | 33               | ↓               | A         | 8.25      | 82.5 | 82.5  | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 2501 336 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 33               | ↓               | A         | 8.25      | 82.5 | 82.5  | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 2501 476 M <sub>1</sub> A <sub>2</sub> 0200 | ↓                   | 47               | ↓               | A         | 11.7      | 117  | 117   | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 2501 476 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 47               | ↓               | A         | 11.7      | 117  | 117   | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 2501 686 M <sub>1</sub> A <sub>2</sub> 0200 | ↓                   | 68               | ↓               | A         | 17.0      | 170  | 170   | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 2501 686 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 68               | ↓               | B         | 17.0      | 170  | 170   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 2501 107 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 100              | ↓               | B         | 25.0      | 250  | 250   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 2501 107 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 100              | ↓               | B         | 25.0      | 250  | 250   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 2501 157 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 150              | ↓               | B         | 37.5      | 375  | 375   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 2501 157 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 150              | ↓               | B         | 37.5      | 375  | 375   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 2501 227 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 220              | ↓               | B         | 55.0      | 550  | 550   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 2501 687 M <sub>1</sub> D <sub>2</sub> 0030 | ↓                   | 680              | ↓               | D         | 170.0     | 1700 | 1700  | 0.10                    | 0.10 | 0.15  | 30                  | 1683                                                                     |
| TCA 4001 226 M <sub>1</sub> A <sub>2</sub> 0200 | 4                   | 22               | 20              | A         | 8.80      | 88.0 | 88.0  | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 4001 226 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 22               | ↓               | A         | 8.80      | 88.0 | 88.0  | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 4001 336 M <sub>1</sub> A <sub>2</sub> 0200 | ↓                   | 33               | ↓               | A         | 13.2      | 132  | 132   | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 4001 336 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 33               | ↓               | A         | 13.2      | 132  | 132   | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 4001 476 M <sub>1</sub> A <sub>2</sub> 0200 | ↓                   | 47               | ↓               | A         | 18.8      | 188  | 188   | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 4001 476 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 47               | ↓               | A         | 18.8      | 188  | 188   | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 4001 686 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 68               | ↓               | B         | 27.2      | 272  | 272   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 4001 107 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 100              | ↓               | B         | 40.0      | 400  | 400   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 4001 107 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 100              | ↓               | B         | 40.0      | 400  | 400   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 4001 157 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 150              | ↓               | B         | 60.0      | 600  | 600   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 4001 157 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 150              | ↓               | B         | 60.0      | 600  | 600   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 4001 227 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 220              | ↓               | B         | 88.0      | 880  | 880   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 4001 227 M <sub>1</sub> C <sub>2</sub> 0060 | ↓                   | 220              | ↓               | C         | 88.0      | 880  | 880   | 0.08                    | 0.08 | 0.12  | 60                  | 1040                                                                     |
| TCA 4001 227 M <sub>1</sub> C <sub>2</sub> 0040 | ↓                   | 220              | ↓               | C         | 88.0      | 880  | 880   | 0.08                    | 0.08 | 0.12  | 40                  | 1275                                                                     |
| TCA 4001 477 M <sub>1</sub> D <sub>2</sub> 0055 | ↓                   | 470              | ↓               | D         | 188       | 1880 | 1880  | 0.10                    | 0.10 | 0.15  | 55                  | 1243                                                                     |
| TCA 4001 477 M <sub>1</sub> D <sub>2</sub> 0040 | ↓                   | 470              | ↓               | D         | 188       | 1880 | 1880  | 0.10                    | 0.10 | 0.15  | 40                  | 1458                                                                     |
| TCA 6301 226 M <sub>1</sub> A <sub>2</sub> 0200 | 6.3                 | 22               | 20              | A         | 13.8      | 138  | 138   | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 6301 226 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 22               | ↓               | A         | 13.8      | 138  | 138   | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 6301 336 M <sub>1</sub> A <sub>2</sub> 0200 | ↓                   | 33               | ↓               | A         | 20.8      | 208  | 208   | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 6301 336 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 33               | ↓               | A         | 20.8      | 208  | 208   | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 6301 336 M <sub>1</sub> B <sub>2</sub> 0080 | ↓                   | 33               | ↓               | B         | 20.8      | 208  | 208   | 0.08                    | 0.08 | 0.12  | 80                  | 791                                                                      |
| TCA 6301 476 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 47               | ↓               | B         | 29.6      | 296  | 296   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 6301 476 M <sub>1</sub> B <sub>2</sub> 0035 | ↓                   | 47               | ↓               | B         | 29.6      | 296  | 296   | 0.08                    | 0.08 | 0.12  | 35                  | 1539                                                                     |
| TCA 6301 686 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 68               | ↓               | B         | 42.8      | 428  | 428   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 6301 107 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 100              | ↓               | B         | 63.0      | 630  | 630   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 6301 107 M <sub>1</sub> B <sub>2</sub> 0055 | ↓                   | 100              | ↓               | B         | 63.0      | 630  | 630   | 0.08                    | 0.08 | 0.12  | 55                  | 953                                                                      |
| TCA 6301 107 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 100              | ↓               | B         | 63.0      | 630  | 630   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 6301 157 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 150              | ↓               | B         | 94.5      | 945  | 945   | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 6301 157 M <sub>1</sub> C <sub>2</sub> 0060 | ↓                   | 150              | ↓               | C         | 94.5      | 945  | 945   | 0.08                    | 0.08 | 0.12  | 60                  | 1040                                                                     |
| TCA 6301 157 M <sub>1</sub> C <sub>2</sub> 0040 | ↓                   | 150              | ↓               | C         | 94.5      | 945  | 945   | 0.08                    | 0.08 | 0.12  | 40                  | 1275                                                                     |
| TCA 6301 227 M <sub>1</sub> B <sub>2</sub> 0025 | ↓                   | 220              | ↓               | B         | 138.6     | 1386 | 1386  | 0.08                    | 0.08 | 0.12  | 25                  | 1822                                                                     |
| TCA 6301 227 M <sub>1</sub> D <sub>2</sub> 0040 | ↓                   | 220              | ↓               | D         | 138       | 1380 | 1380  | 0.10                    | 0.10 | 0.15  | 40                  | 1458                                                                     |
| TCA 6301 337 M <sub>1</sub> D <sub>2</sub> 0055 | ↓                   | 330              | ↓               | D         | 208       | 2080 | 2080  | 0.10                    | 0.10 | 0.15  | 55                  | 1243                                                                     |
| TCA 6301 337 M <sub>1</sub> D <sub>2</sub> 0040 | ↓                   | 330              | ↓               | D         | 208       | 2080 | 2080  | 0.10                    | 0.10 | 0.15  | 40                  | 1458                                                                     |
| TCA 1002 226 M <sub>1</sub> A <sub>2</sub> 0200 | 10                  | 22               | 20              | A         | 22.0      | 220  | 220   | 0.06                    | 0.06 | 0.09  | 200                 | 474                                                                      |
| TCA 1002 226 M <sub>1</sub> A <sub>2</sub> 0180 | ↓                   | 22               | ↓               | A         | 22.0      | 220  | 220   | 0.06                    | 0.06 | 0.09  | 180                 | 500                                                                      |
| TCA 1002 336 M <sub>1</sub> B <sub>2</sub> 0080 | ↓                   | 33               | ↓               | B         | 33.0      | 330  | 330   | 0.08                    | 0.08 | 0.12  | 80                  | 791                                                                      |
| TCA 1002 476 M <sub>1</sub> B <sub>2</sub> 0070 | ↓                   | 47               | ↓               | B         | 47.0      | 470  | 470   | 0.08                    | 0.08 | 0.12  | 70                  | 845                                                                      |
| TCA 1002 476 M <sub>1</sub> B <sub>2</sub> 0035 | ↓                   | 47               | ↓               | B         | 47.0      | 470  | 470   | 0.08                    | 0.08 | 0.12  | 35                  | 1539                                                                     |
| TCA 1002 686 M <sub>1</sub> C <sub>2</sub> 0060 | ↓                   | 68               | ↓               | C         | 68.0      | 680  | 680   | 0.08                    | 0.08 | 0.12  | 60                  | 1040                                                                     |
| TCA 1002 686 M <sub>1</sub> C <sub>2</sub> 0045 | ↓                   | 68               | ↓               | C         | 68.0      | 680  | 680   | 0.08                    | 0.08 | 0.12  | 45                  | 1202                                                                     |
| TCA 1002 157 M <sub>1</sub> D <sub>2</sub> 0055 | ↓                   | 150              | ↓               | D         | 150       | 1500 | 1500  | 0.10                    | 0.10 | 0.15  | 55                  | 1243                                                                     |
| TCA 1002 157 M <sub>1</sub> D <sub>2</sub> 0040 | ↓                   | 150              | ↓               | D         | 150       | 1500 | 1500  | 0.10                    | 0.10 | 0.15  | 40                  | 1458                                                                     |

Notes : <sup>(1)</sup> <sub>1</sub>: No code for single item. 'R' and 'N' for taping specification

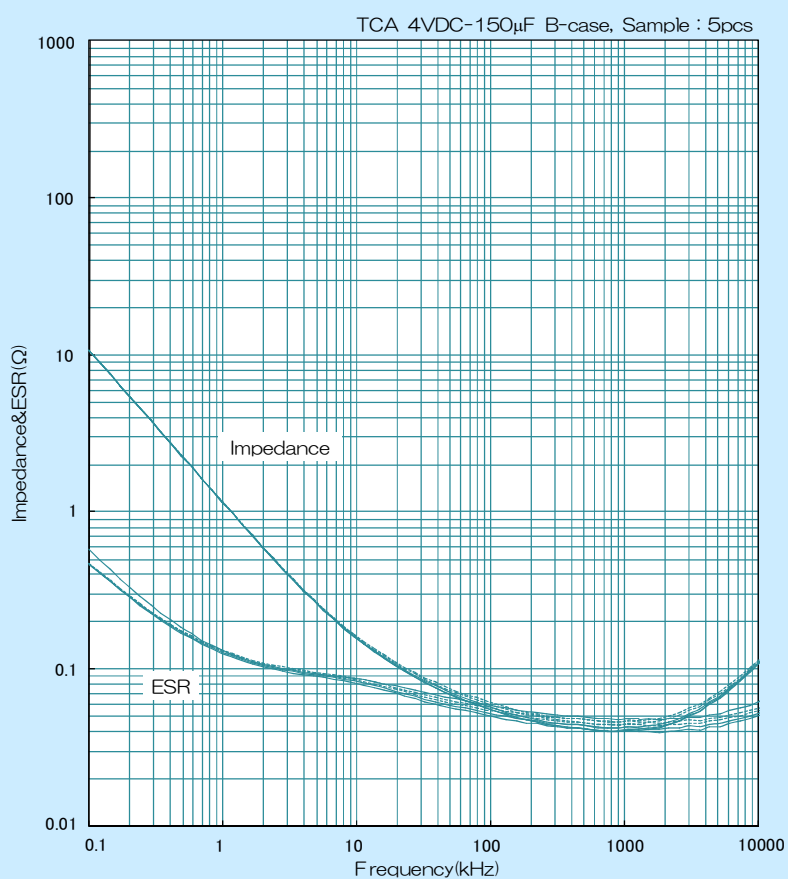
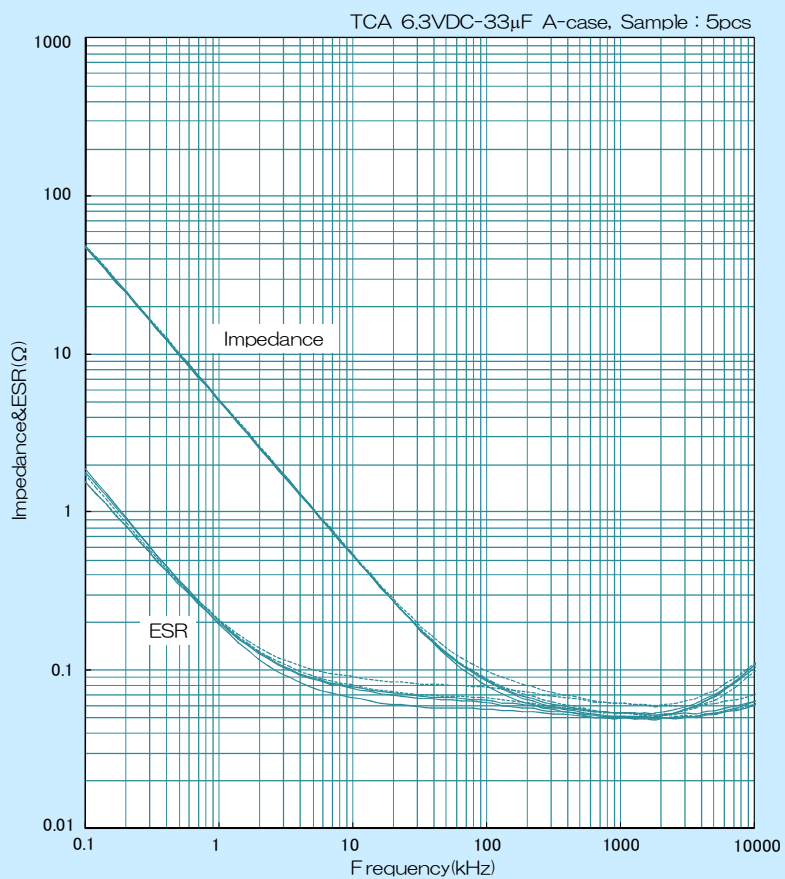
<sup>(2)</sup> Insert mark for stratification into <sub>2</sub>. Example: "7" indicates halogen-free products.

<sup>(3)</sup> Reference value.

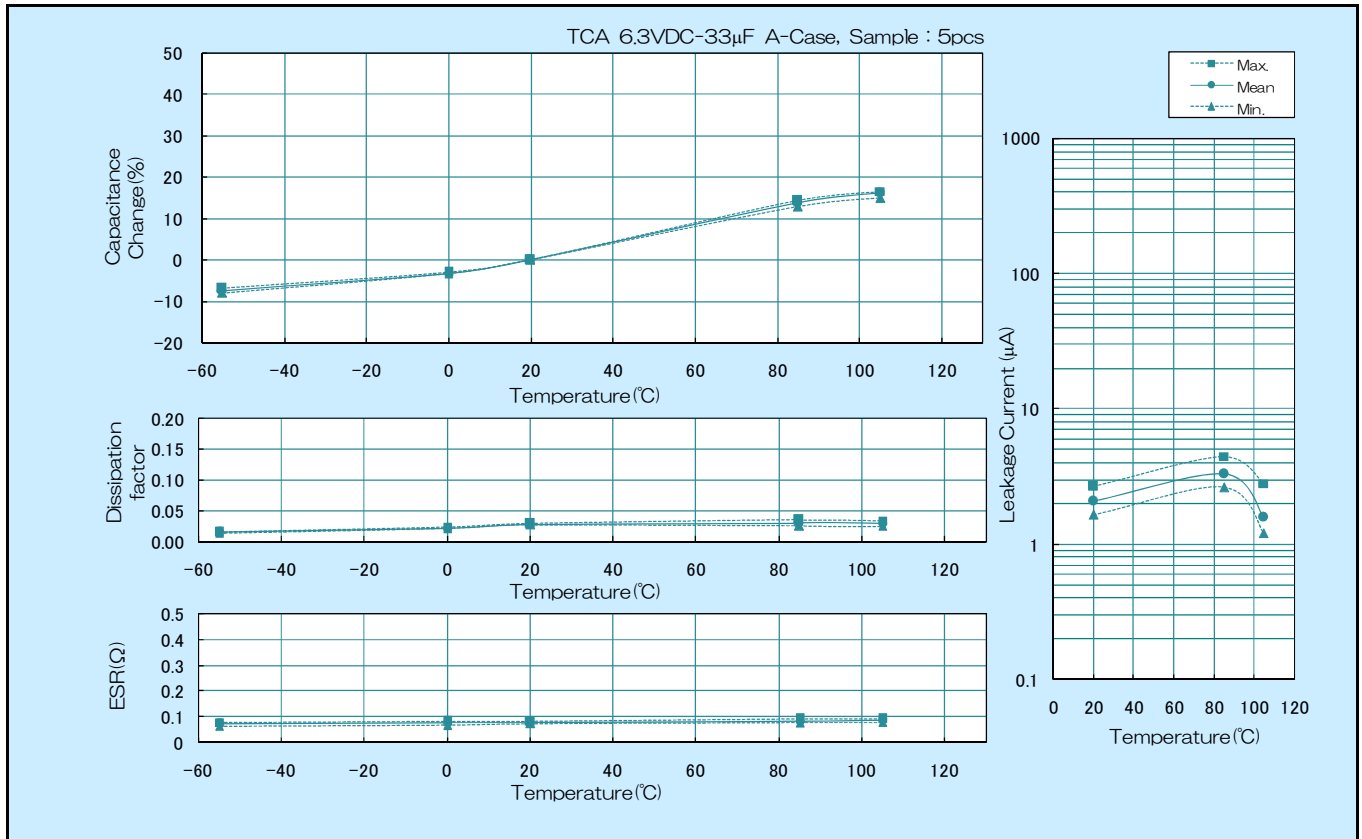
## PERFORMANCE

| No                  | Item                                        | Performance                                                                                                                                                                                                                                                                              |                                  |                                                  | Test Method                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
|---------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----|---|-----|----|---------------------|----------|-----|-----|----|-----------|-----|-----|------|
| 1                   | Leakage Current (μA)                        | Shall not exceed 0.1 CV Max. or the values shown in CATALOG NUMBERS AND RATING.                                                                                                                                                                                                          |                                  |                                                  | JIS C 5101-1, 4.9<br>Applied voltage : Rated voltage<br>Duration : 5 min<br>Measuring temperature : 20 ±2°C                                                                                                                                                                                                                                                                                                                                                       |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 2                   | Capacitance (μF)                            | Shall be within specified tolerances.                                                                                                                                                                                                                                                    |                                  |                                                  | JIS C 5101-1, 4.7<br>Measuring frequency : 120 Hz ±20%<br>Measuring temperature : 20 ±2°C                                                                                                                                                                                                                                                                                                                                                                         |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 3                   | Dissipation Factor                          | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                                                                                                                                                                                         |                                  |                                                  | JIS C 5101-1, 4.8<br>Test conditions shown in No.2                                                                                                                                                                                                                                                                                                                                                                                                                |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 4                   | Equivalent Series Resistance                | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                                                                                                                                                                                         |                                  |                                                  | JIS C 5101-1, 4.8<br>Measuring frequency : 100 kHz ±10%<br>Measuring temperature : 20 ±2°C                                                                                                                                                                                                                                                                                                                                                                        |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 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 specified tolerances      | Shall not exceed the value in No.3.              | 20 ±2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
|                     | Step 2                                      | —                                                                                                                                                                                                                                                                                        | Withi 0/-20% of value at 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 value at Step 1    | Shall not exceed the value in No.3.              | 20 ±2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
|                     | Step 4                                      | Shall not exceed 10-times of the value in No.1.                                                                                                                                                                                                                                          | —                                | —                                                | 85 ±2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
|                     | Step 5                                      | Shall not exceed 10-times of the value in No.1.                                                                                                                                                                                                                                          | Within +50/0% of value at Step 1 | Shall not exceed 1.5-times of the value in No.3. | 105 ±2°C<br>Derated voltage at 105°C                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
|                     | Step 6                                      | Shall not exceed the value in No.1.                                                                                                                                                                                                                                                      | Within ±5% of value at Step 1    | Shall not exceed the value in No.3.              | 20 ±2°C                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 6                   | Surge                                       | Leakage current : Shall not exceed 3-times of the value in No.1.<br>Capacitance change : Within ±20% of the value before 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>Test temperature : 85°C and 105°C<br>Applied voltage : According to the following table<br><table><tr><td>Rated voltage (VDC)</td><td>2.5</td><td>4</td><td>6.3</td><td>10</td></tr><tr><td rowspan="2">Surge voltage (VDC)</td><td>85°C 3.3</td><td>5.2</td><td>8.2</td><td>13</td></tr><tr><td>105°C 2.6</td><td>4.2</td><td>6.5</td><td>10.4</td></tr></table><br>Series protective resistance : 1000 Ω<br>Discharge resistance : 1000 Ω | Rated voltage (VDC) | 2.5 | 4 | 6.3 | 10 | Surge voltage (VDC) | 85°C 3.3 | 5.2 | 8.2 | 13 | 105°C 2.6 | 4.2 | 6.5 | 10.4 |
| Rated voltage (VDC) | 2.5                                         | 4                                                                                                                                                                                                                                                                                        | 6.3                              | 10                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| Surge voltage (VDC) | 85°C 3.3                                    | 5.2                                                                                                                                                                                                                                                                                      | 8.2                              | 13                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
|                     | 105°C 2.6                                   | 4.2                                                                                                                                                                                                                                                                                      | 6.5                              | 10.4                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 7                   | Shear Test                                  | No separation of terminal from solder.                                                                                                                                                                                                                                                   |                                  |                                                  | JIS C 5101-1, 4.34<br>Force : 5 N<br>Holding time : 5 ±1 sec                                                                                                                                                                                                                                                                                                                                                                                                      |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 8                   | Substrate Bending Test                      | Capacitance : Initial value to remain steady during measurement.<br>Visual Examination : There shall be no evidence of mechanical damage.                                                                                                                                                |                                  |                                                  | JIS C 5101-1, 4.35<br>Bending : 3 mm                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 9                   | Vibration                                   | Capacitance : Initial value to remain steady during measurement.<br>Visual Examination : There shall be no evidence of mechanical damage.                                                                                                                                                |                                  |                                                  | JIS C 5101-1, 4.17<br>Frequency range : 10-55 Hz Swing width : 1.5 mm<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 0.5 ms 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 : 490 m/s <sup>2</sup><br>Duration : 11 ms<br>Wave form : Half-sine                                                                                                                                                                                                                                                                                                                                                       |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 11                  | Solderability                               | Shall be covered to over 3/4 of terminal surface by new soldering.                                                                                                                                                                                                                       |                                  |                                                  | JIS C 5101-1, 4.15<br>Solder temperature : 230 ±5°C<br>Dipping time : 3 to 5 seconds<br>Dipping depth : Terminal shall be dipped into melted solder                                                                                                                                                                                                                                                                                                               |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 12                  | Resistance to Soldering Heat                | Leakage Current : Shall not exceed 2-times of the value in No.1.<br>Capacitance change : Within ±20% of the value before test.<br>Dissipation Factor : Shall not exceed 1.3-times of the value in No.3.<br>Visual Examination : There shall be no evidence of mechanical damage.         |                                  |                                                  | JIS C 5101-1, 4.14<br>IR reflow Preheating : 140 to 160°C, 110 to 130 sec<br>Reflow : 200°C, 25 to 30 sec<br>Peak : 240°C max.<br>Number of cycles : 2                                                                                                                                                                                                                                                                                                            |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 13                  | Component Solvent Resistance                | Leakage Current : Shall not exceed the value in No.1.<br>Capacitance change : Within ±20% of the value before test.<br>Dissipation Factor : Shall not exceed the value in No.3.                                                                                                          |                                  |                                                  | JIS C 5101-1, 4.31<br>Temperature : 23 ±5°C<br>Dipping time : 5 ±0.5 min.<br>Conditioning : JIS C 0052 method 2<br>Solvent : 2-propanol (Isopropyl alcohol)                                                                                                                                                                                                                                                                                                       |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 14                  | Solvent Resistance of Marking               | Visual examination : After the test the marking shall be legible.                                                                                                                                                                                                                        |                                  |                                                  | JIS C 5101-1, 4.32<br>Temperature : 23 ±5°C<br>Dipping time : 5 ±0.5 min.<br>Conditioning : JIS C 0052 method 2<br>Solvent : 2-propanol (Isopropyl alcohol)                                                                                                                                                                                                                                                                                                       |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 15                  | Rapid Change of Temperature                 | Leakage Current : Shall not exceed 2-times of the value in No.1.<br>Capacitance change : Within ±20% of the value before test.<br>Dissipation Factor : Shall not exceed 1.5-times of the value in No.3.<br>Visual Examination : There shall be no evidence of mechanical damage.         |                                  |                                                  | JIS C 5101-1, 4.16<br>Step 1 : -55 ±3°C, 30 ±3 min<br>Step 2 : 25 +10/-5°C, 3 min or less<br>Step 3 : 105 ±2°C, 30 ±3 min<br>Step 4 : 25 +10/-5°C, 3 min or less<br>Number of cycles : 5                                                                                                                                                                                                                                                                          |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 16                  | Damp Heat, Steady State                     | Leakage Current : Shall not exceed 2-times of the value in No.1.<br>Capacitance change : Within -20% to +40% of the value before test.<br>Dissipation Factor : Shall not exceed 1.5-times of the value in No.3.<br>Visual Examination : There shall be no evidence of mechanical damage. |                                  |                                                  | JIS C 5101-1, 4.21<br>Temperature : 40 ±2°C<br>Moisture : 90 to 95% RH<br>Duration : 500 +24/0hrs<br>Measurement after test: After the capacitor being stored under standard atomospheric conditions for 24 hours, leakage current, capacitance and dissipation factor shall be measured.                                                                                                                                                                         |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 17                  | Endurance I                                 | Leakage Current : Shall not exceed 2-times of the value in No.1.<br>Capacitance change : Within ±20% of the value before test.<br>Dissipation Factor : Shall not exceed 1.5-times of the value in No.3.<br>Visual Examination : There shall be no evidence of mechanical damage.         |                                  |                                                  | JIS C 5101-1, 4.23<br>Test temperature : 85 ±2°C<br>Applied voltage : Rated voltage<br>Duration : 1000 +48/0hrs<br>Power supply impedance : 3Ω or less<br>Measurement after test: After the capacitor being stored under standard atomospheric conditions for 24 hours, leakage current, capacitance and dissipation factor shall be measured.                                                                                                                    |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |
| 18                  | Endurance II                                | Leakage Current : Shall not exceed 2-times of the value in No.1.<br>Capacitance change : Within ±20% of the value before test.<br>Dissipation Factor : Shall not exceed 3-times of the value in No.3.<br>Visual Examination : There shall be no evidence of mechanical damage.           |                                  |                                                  | JIS C 5101-1, 4.23<br>Test temperature : 105 ±2°C<br>Applied voltage : Derated voltage<br>Duration : 1000 +48/0hrs<br>Power supply impedance : 3Ω or less<br>Measurement after test: After the capacitor being stored under standard atomospheric conditions for 24 hours, leakage current, capacitance and dissipation factor shall be measured.                                                                                                                 |                     |     |   |     |    |                     |          |     |     |    |           |     |     |      |

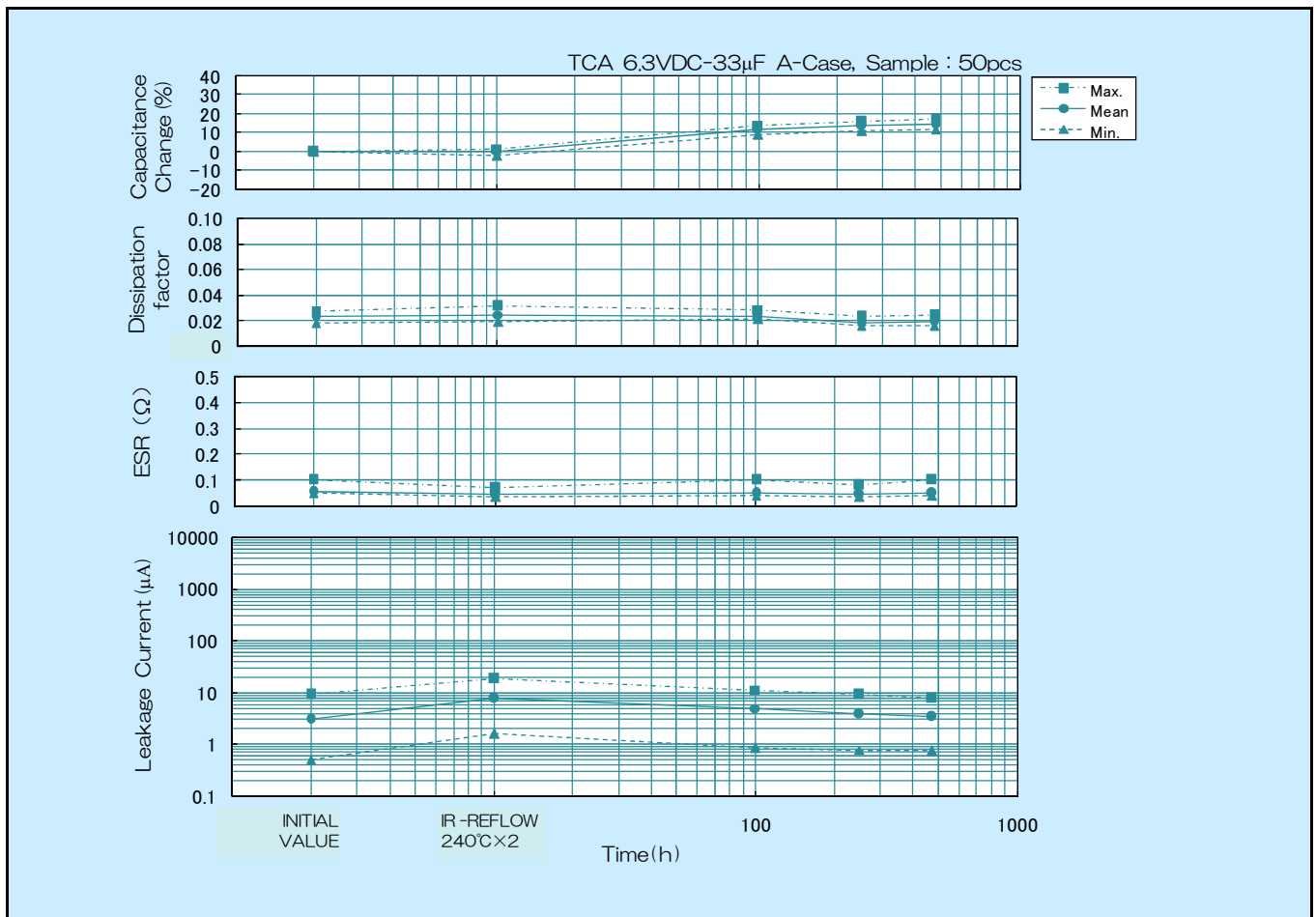
## FREQUENCY CHARACTERISTICS



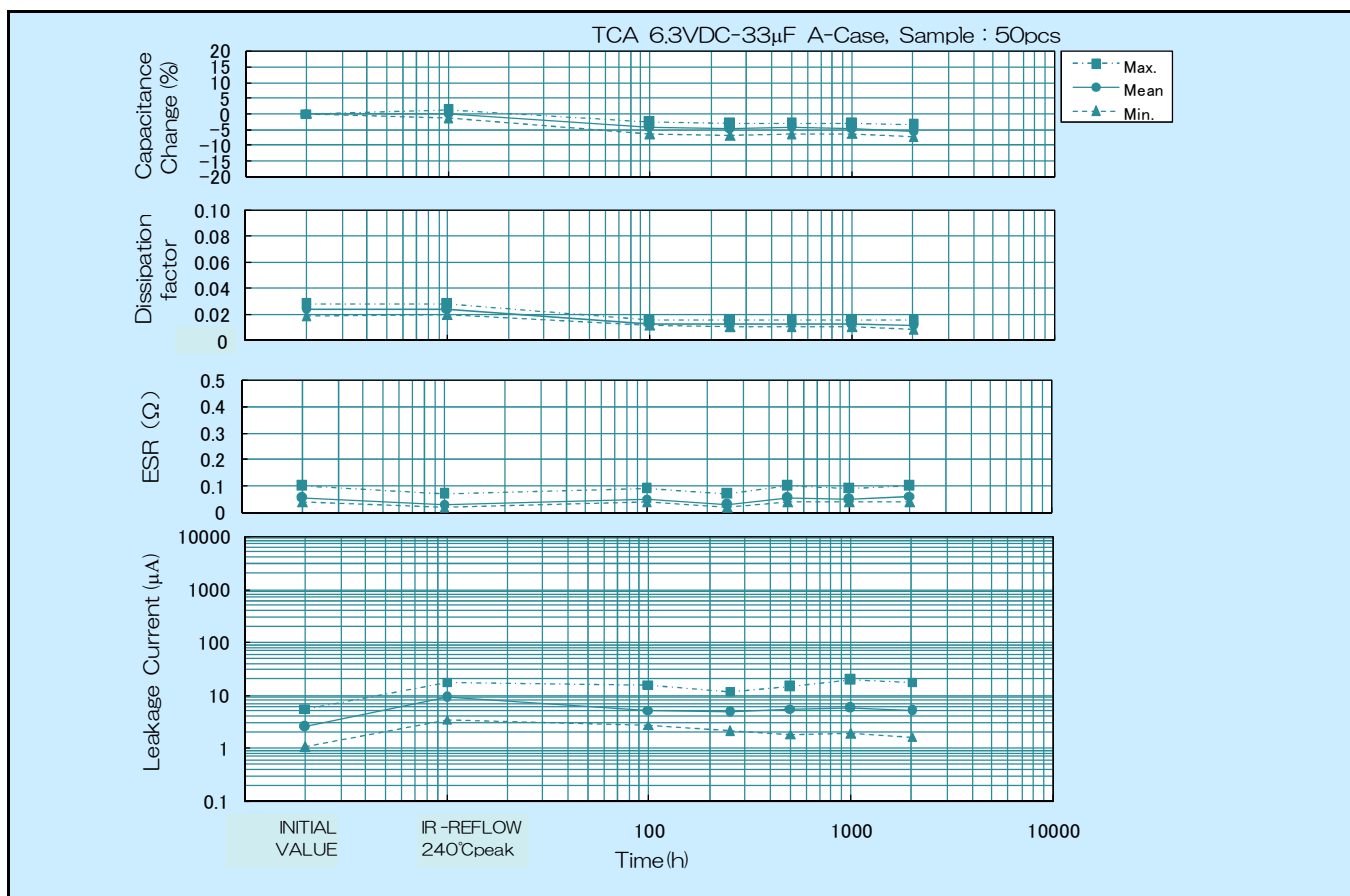
## CHARACTERISTICS AT HIGH AND LOW TEMPERATURE



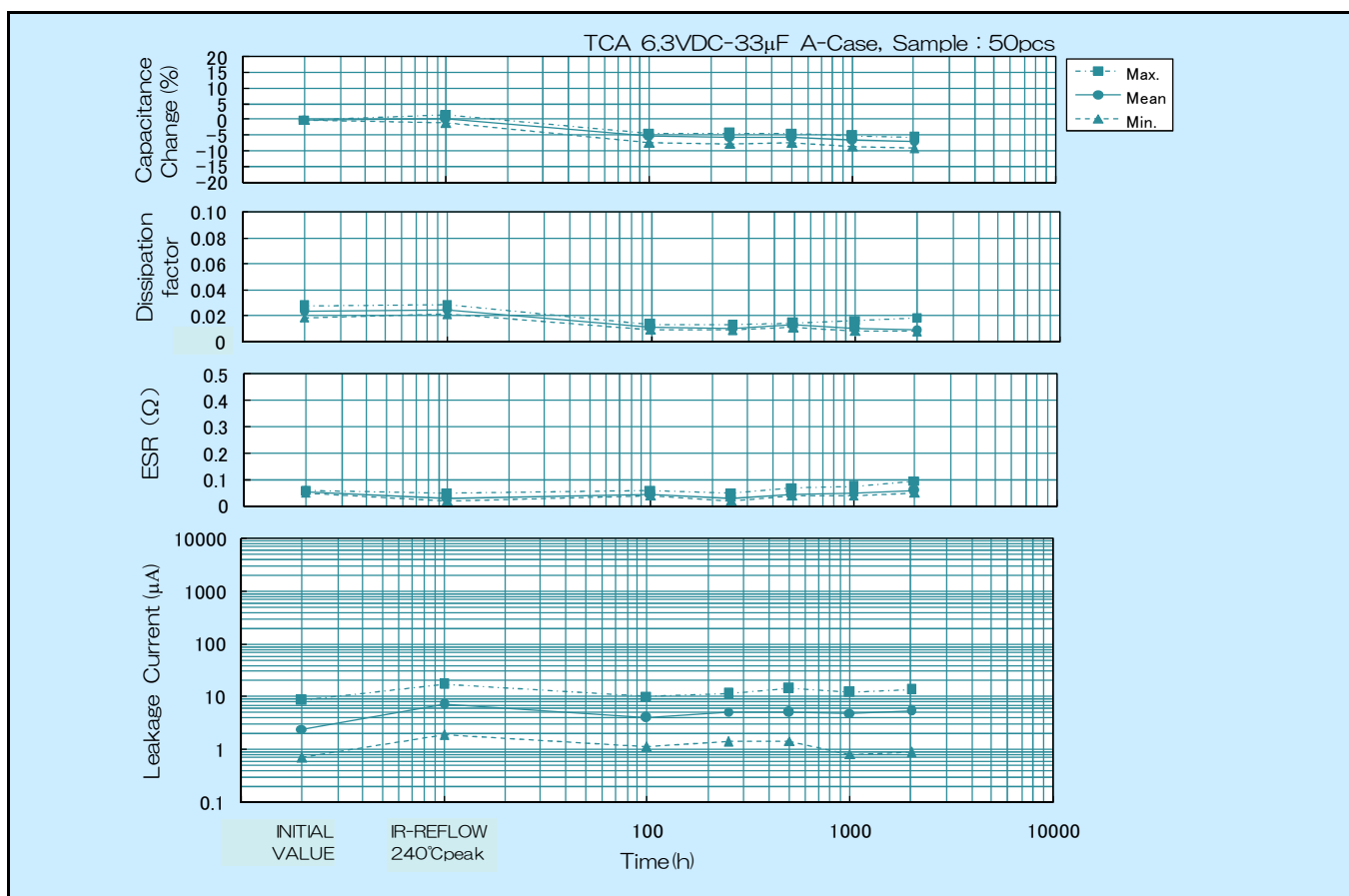
## HIGH TEMPERATURE / MOISTURE 40°C , 95%RH



## ENDURANCE I 85°C RATED VOLTAGE



## ENDURANCE II 105°C DERATED VOLTAGE





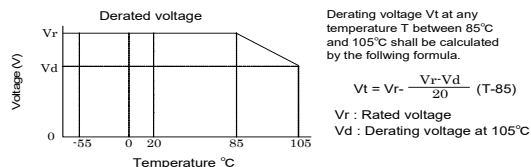


## Application Notes for Tantalum Solid Electrolytic Capacitor with Conductive Polymer Type TCA

### 1. Operating voltage

The capacitors 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.

- Recommended operating voltage : 80% or less of the rated voltage
- When the operating temperature exceeds 85°C, derate the applied voltage. The voltage derating formula is shown below.



| $V_r$ | Rated voltage(VDC)   | 2.5 | 4   | 6.3 | 10  |
|-------|----------------------|-----|-----|-----|-----|
| $V_d$ | Derated voltage(VDC) | 2.0 | 3.2 | 5.0 | 8.0 |

### 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.
- (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

The permissible ripple current and voltage at about 100 kHz or higher can be determined by the following formula from the permissible power loss for each case code (Pmax value) shown in Table 1 and the specified ESR value. However, when the expected operating temperature is higher than room temperature, determine the permissible values multiplying the Pmax value by the specified multiplier (Table 2). For the permissible values at different frequencies, consult our Sales Department.

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

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

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

$I_{max}$ : Permissible ripple current at regulated frequency (Arms : RMS value)  
 $E_{max}$ : Permissible ripple voltage at regulated frequency (Vrms : RMS value)  
 $P_{max}$ : Permissible power loss (W)  
 $ESR$ : Specified ESR value at regulated frequency ( $\Omega$ )  
 $Z$ : Impedance at regulated frequency ( $\Omega$ )

Table 1 Permissible power loss for each case code

| Case Code | Pmax (W) |
|-----------|----------|
| A         | 0.045    |
| B         | 0.050    |
| C         | 0.065    |
| D         | 0.085    |

Note: Above values are measured at 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 equal to or greater than above list of Pmax value.

Table 2 Pmax multiplier at each operating temperature

| Operating temperature | Multiplier |
|-----------------------|------------|
| 20                    | 1.0        |
| 55                    | 0.9        |
| 65                    | 0.86       |
| 85                    | 0.8        |
| 105                   | 0.4        |

### 5. Non Polar Connection

The capacitor cannot be used as a non-polar unit.

### 6. Soldering

#### 6.1 Preheating

To obtain optimal reliability, lowering the heat shock during the soldering process is favorable. Capacitors should be pre-heated at 140~160°C for approximately 110~130 seconds.

#### 6.2 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 circuit 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.

### 7. 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.

### 8. 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  $\text{cm}^2$ .
- (3) The cleaning time should be kept to a minimum. Also, samples must be swang in the solvent. Please consult us.

#### 9. Storage

The plastic reel (made of PS) used for packaging the product is intended for use in ambient temperatures (5-35°C). To prevent issues during automated insertion due to reel deformation or other factors, please keep the reel away from direct sunlight and heat sources, and ensure it does not reach high temperatures (above 60°C), including during transportation. Capacitors should be tightly sealed in moisture prevention bag and stored with supplied reel. After unpacking, capacitors should be used within the floor life listed in Table 3.

Moisture Sensitivity Level : Table 3 shows the moisture sensitivity level and the floor life of the dampproof wrapping products.

Table 3 MSL&Floor Life

| JEDEC MSL | Floor Life           |
|-----------|----------------------|
| 3         | 168hrs.(7days)       |
|           | Less than 30°C/60%RH |

(Reference IPC/JEDEC J-STD-020C July 2004)

#### 10. Inapplicable circuits

The capacitors may cause nonconformity if they are used on the following circuits.

- (1) High-impedance voltage holding circuits
- (2) Coupling circuits
- (3) Time constant circuits
- (4) Circuits significantly affected by leakage current

If a short circuit occurs, the capacitors may generate heat or smoke depending on the short-circuit current. When designing a circuit, take the instructions stated herein into consideration, and take as much redundant measures as possible.

#### 11. Additional Notes

Wear-out failure (Lifetime)

When the operating time exceeded the specified guarantee time of Endurance and Damp heat, the electric characteristics changes significantly and the open circuit might be caused by the degradation of electrolyte.

Please note that the electric characteristics of capacitance and ESR might change within the specified range in specifications when it used under the condition of electric and mechanical performance.

These application notes are prepared based on the technical report RCR-2368B "Guideline of notabilia for fixed tantalum electrolytic capacitors with solid electrolyte for use in electronic equipment" issued by Japan Electronics and Information Technology Industries Association. For the details of the instructions (explanation, reasons and concrete examples), please refer to this guideline, or consult our Sales Department.



### MATSUO ELECTRIC CO., LTD.

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

Overseas Sales 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

URL <https://www.ncc-matsuo.co.jp/>

**Specifications on this catalog are subject to change without prior notice. Please inquire of our Sales Department to confirm specifications prior to use.**

## 適用用途分類 / APPLICATION CLASSIFICATION BY USE

Rev.6 (2023.03.01)

| 市場      | 適用用途分類 | 用途                                                                                                                                          |                                                                                                                                                    | 推奨品種                                        | 推奨品種                                                     | 推奨品種                                                                       | 推奨品種                                              |
|---------|--------|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------|
|         |        | 概要                                                                                                                                          | 代表的なアプリケーション例                                                                                                                                      | チップタンタルコンデンサ                                | リード付タンタルコンデンサ                                            | 回路保護素子                                                                     | フィルムコンデンサ                                         |
| 高信頼度機器  | 1      | <ul style="list-style-type: none"> <li>高度な安全性や信頼性が要求される機器</li> <li>製品の保守交換が不可能な機器、製品の故障が人命に直接かわる、または、致命的なシステムダウンを引き起こす可能性がある機器</li> </ul>   | <ul style="list-style-type: none"> <li>宇宙開発機器関連(衛星、ロケット、人工衛星)</li> <li>航空・防衛システム</li> <li>原子力・火力・水力発電システム</li> </ul>                               | 267型Pシリーズ                                   | 111型Pシリーズ                                                | 該当なし                                                                       | 該当なし                                              |
| 車載・産業機器 | 2      | <ul style="list-style-type: none"> <li>信頼性が重視される機器</li> <li>製品の保守交換が極めて困難な機器や、製品の故障が人命に影響する、あるいは故障の範囲が広範囲である機器</li> </ul>                   | <ul style="list-style-type: none"> <li>自動車および鉄道・船舶等の輸送機器の車両制御(エンジン制御、駆動制御、ブレーキ制御)</li> <li>新幹線・主要幹線の運行制御システム</li> </ul>                            | 267型Nシリーズ<br>271型Nシリーズ<br>279型Mシリーズ         | 111型Nシリーズ<br>111型Mシリーズ<br>112型Mシリーズ<br>204型Nシリーズ<br>247型 | JAG型Nシリーズ<br>JAJ型Nシリーズ<br>JAK型Nシリーズ<br>JHC型Nシリーズ<br>KAB型Nシリーズ<br>KVA型Nシリーズ | 431型<br>431型Aシリーズ<br>503型<br>553型<br>801型<br>802型 |
|         | 3      | <ul style="list-style-type: none"> <li>製品の保守交換が可能な機器や、製品の故障が人命に影響しないが故障によるシステムダウンの損失が大きく保全管理が要求される機器</li> </ul>                             | <ul style="list-style-type: none"> <li>エアコン、カーナビ等の車室内搭載部品、車載用通信機器</li> <li>家庭用/ビル用等のセキュリティ管理システム</li> <li>工業用ロボットや工作機械等の制御機器</li> </ul>            | 267型Mシリーズ<br>267型Eシリーズ<br>281型Mシリーズ<br>TCA型 | 204型Mシリーズ                                                | KAB型Mシリーズ                                                                  |                                                   |
| 汎用機器    | 4      | <ul style="list-style-type: none"> <li>最先端技術を積極的に適用する小型・薄型品</li> <li>製品の保守交換が可能な機器や、製品の故障によるシステムダウンが部分的な機器向けの市場で広く使用されることを想定した製品</li> </ul> | <ul style="list-style-type: none"> <li>スマートフォン、携帯電話、モバイルPC(タブレット)、電子辞書</li> <li>デスクトップPC、ノートPC、ホームネットワーク</li> <li>アミューズメント機器(パチンコ、ゲーム機)</li> </ul> | 251型Mシリーズ<br>281型Eシリーズ<br>TCB型              |                                                          | JAE型、JAG型<br>JAJ型、JAK型<br>JHC型<br>KAB型<br>KAB Tシリーズ<br>KVA型                | 503型Aシリーズ                                         |

| Market                                  | Application classification by use | Use                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                          | Recommendation Type                                                     | Recommendation Type                                                                          | Recommendation Type                                                                                                        | Recommendation Type                                                           |
|-----------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|                                         |                                   | Outline                                                                                                                                                                                                                                                                                                                                 | Typical example of application                                                                                                                                                                                                                                                                                           | Chip Tantalum Capacitors                                                | Leaded Tantalum Capacitors                                                                   | Circuit Protection Components                                                                                              | Film Capacitors                                                               |
| High reliability apparatus              | 1                                 | <ul style="list-style-type: none"> <li>- Apparatus in which advanced safety and reliability are demanded.</li> <li>- Whether failure of the apparatus which cannot maintenance exchange products, and a product is direct for a human life, apparatus which changes or may cause a fatal system failure.</li> </ul>                     | <ul style="list-style-type: none"> <li>- Space development apparatus relation (Satellite, Rocket, Artificial Satellite)</li> <li>- Aviation and a defensive system</li> <li>- Atomic power, fire power, and a water-power generation system</li> </ul>                                                                   | Type 267 P Sereis                                                       | Type 111 P series                                                                            | With no relevance                                                                                                          | With no relevance                                                             |
| In-vehicle<br>-<br>Industrial apparatus | 2                                 | <ul style="list-style-type: none"> <li>- Apparatus in which reliability is important.</li> <li>- The apparatus in which maintenance exchange of a product is very difficult, and failure of a product influence a human life, or the range of failure is wide range.</li> </ul>                                                         | <ul style="list-style-type: none"> <li>- Vehicles control of transport machines, such as a car, and a railroad, a vessel (Engine control, drive control, brake control)</li> <li>- The operation control system of the Shinkansen and a main artery</li> </ul>                                                           | Type 267 N Sereis<br>Type 271 N Sereis<br>Type 279 M Sereis             | Type 111 N series<br>Type 111 M series<br>Type 112 M series<br>Type 204 N series<br>Type 247 | Type JAG N series<br>Type JAJ N series<br>Type JAK N series<br>Type JHC N series<br>Type KAB N series<br>Type KVA N series | Type 431<br>Type 431 A series<br>Type 503<br>Type 553<br>Type 801<br>Type 802 |
|                                         | 3                                 | <ul style="list-style-type: none"> <li>-Apparatus which can maintenance exchange products, and apparatus in which the loss of the system failure is large although failure of a product does not influence a human life, and maintenance engineering is demanded</li> </ul>                                                             | <ul style="list-style-type: none"> <li>- Vehicle indoor loading parts, such as an air-conditioner and car navigation, and in-vehicle communication facility</li> <li>- Security management system for home/buildings etc.</li> <li>- Control apparatus, such as Industrial use robots and a machine tool etc.</li> </ul> | Type 267 M Sereis<br>Type 267 E Sereis<br>Type 281 M Sereis<br>Type TCA | Type 204 M series                                                                            | Type KAB M series                                                                                                          |                                                                               |
| Apparatus in general                    | 4                                 | <ul style="list-style-type: none"> <li>- The small size and the thin article which applies leading-edge technology positively</li> <li>- The product supposing being used widely in the market for the apparatus which can maintenance exchange products, and apparatus with a partial system failure by failure of product.</li> </ul> | <ul style="list-style-type: none"> <li>-Smart phone, Mobile phone, Mobile PC (tablet), Electronic dictionary</li> <li>- Desktop PC, Notebook PC, Home network</li> <li>- Amusement apparatus (Pachinko, Game machine)</li> </ul>                                                                                         | Type 251M Series<br>Type 281 E Series<br>Type TCB                       |                                                                                              | Type JAE, Type JAG<br>Type JAJ, Type JAK<br>Type JHC<br>Type KAB<br>Type KAB T series<br>Type KVA                          | Type 503 A series                                                             |

テーピング数量・リール寸法  
Taping Quantity And Carrier Tape Dimensions

チップタンタルコンデンサ  
Chip Tantalum Capacitors

定格：251型Mシリーズ, TCB型  
Type：251 M Series, TCB

| ケース記号<br>Case Code | ケースサイズ<br>Case size | W<br>(mm) | F<br>(mm) | E<br>(mm) | P <sub>1</sub><br>(mm) | P <sub>2</sub><br>(mm) | P <sub>0</sub><br>(mm) | φ D <sub>0</sub><br>(mm)         | 包装数/リール(個)<br>Quantity/Reel (pcs) |
|--------------------|---------------------|-----------|-----------|-----------|------------------------|------------------------|------------------------|----------------------------------|-----------------------------------|
|                    |                     |           |           |           |                        |                        |                        |                                  | φ 180                             |
| U                  | 1.0×0.5             | 8.0±0.3   | 3.5±0.05  | 1.75±0.1  | 2.0±0.05               | 2.0±0.05               | 4.0±0.1                | 1.55±0.03                        | 10,000                            |
| M                  | 1.6×0.8             |           |           |           | 4.0±0.1                |                        |                        | 1.5 <sup>+0.1</sup> <sub>0</sub> | 3,000                             |
| S                  | 2.0×1.25            |           |           |           |                        |                        |                        |                                  |                                   |
| A                  | 3.2×1.6             |           |           |           |                        |                        |                        |                                  |                                   |

定格：267型Mシリーズ, 267型Eシリーズ, 267型Pシリーズ, 271Nシリーズ  
279型Mシリーズ, 281型Mシリーズ, 281型Eシリーズ  
Type：267 M Series, 267 E Series, 267 P Series, 271 N Series  
279 M Series, 281 M Series, 281 E Series

| ケース記号<br>Case Code | ケースサイズ<br>Case size | W<br>(mm) | F<br>(mm) | E<br>(mm) | P <sub>1</sub><br>(mm) | P <sub>2</sub><br>(mm) | P <sub>0</sub><br>(mm) | D <sub>0</sub><br>(mm)             | 包装数/リール(個)<br>Quantity/Reel (pcs) |       |
|--------------------|---------------------|-----------|-----------|-----------|------------------------|------------------------|------------------------|------------------------------------|-----------------------------------|-------|
|                    |                     |           |           |           |                        |                        |                        |                                    | φ 180                             | φ 330 |
| A                  | 3.2×1.6             | 8.0±0.3   | 3.5±0.05  | 1.75±0.1  | 4.0±0.1                | 2.0±0.05               | 4.0±0.1                | φ 1.5 <sup>+0.1</sup> <sub>0</sub> | 2,000                             | 9,000 |
| B                  | 3.5×2.8             |           |           |           | 8,000                  |                        |                        |                                    |                                   |       |
| C3                 | 6.0×3.2             | 12.0±0.3  | 5.5±0.05  | 1.5±0.1   | 8.0±0.1                |                        |                        |                                    | 500                               | 3,000 |
| D3                 | 7.3×4.4             |           | 5.7±0.05  |           |                        |                        |                        |                                    |                                   | 2,500 |
| H                  | 7.3×4.4             |           | 5.7±0.1   |           |                        |                        |                        |                                    |                                   | 1,500 |
| E                  | 7.3×5.8             |           | 5.5±0.05  | 1.75±0.05 |                        |                        |                        |                                    |                                   | 2,000 |

定格：267型Nシリーズ, TCA型  
Type：267 N Series, TCA

| ケース記号<br>Case Code | ケースサイズ<br>Case size | W<br>(mm) | F<br>(mm) | E<br>(mm) | P <sub>1</sub><br>(mm) | P <sub>2</sub><br>(mm) | P <sub>0</sub><br>(mm) | D <sub>0</sub><br>(mm)             | 包装数/リール(個)<br>Quantity/Reel (pcs) |       |
|--------------------|---------------------|-----------|-----------|-----------|------------------------|------------------------|------------------------|------------------------------------|-----------------------------------|-------|
|                    |                     |           |           |           |                        |                        |                        |                                    | φ 180                             | φ 330 |
| A                  | 3.2×1.6             | 8.0±0.3   | 3.5±0.05  | 1.75±0.1  | 4.0±0.1                | 2.0±0.05               | 4.0±0.1                | φ 1.5 <sup>+0.1</sup> <sub>0</sub> | 2,000                             | 9,000 |
| B                  | 3.5×2.8             |           |           |           | 8.0±0.1                |                        |                        |                                    |                                   | 8,000 |
| C                  | 6.0×3.2             | 12.0±0.3  | 5.5±0.05  | 8.0±0.1   | 500                    |                        |                        |                                    | 3,000                             |       |
| D                  | 7.3×4.4             |           | 5.7±0.05  |           |                        |                        |                        |                                    | 2,500                             |       |

回路保護素子  
Circuit Protection Components

定格：JAE型, JAG型, JAG型Nシリーズ, JAJ型, JAJ型Nシリーズ, JAK型, JAK型Nシリーズ, JHC型, JHC型Nシリーズ  
KAB型, KAB型Nシリーズ, KAB型Mシリーズ, KAB型Tシリーズ, KVA型, KVA型Nシリーズ  
Type：JAE, JAG, JAG N Series, JAJ, JAJ N Series, JAK, JAK N Series, JHC, JHC N Series  
KAB, KAB N Series, KAB M Series, KAB T Series, KVA, KVA N Series

| ケース記号<br>Case Code | ケースサイズ<br>Case size | W<br>(mm) | F<br>(mm) | E<br>(mm) | P <sub>1</sub><br>(mm) | P <sub>2</sub><br>(mm) | P <sub>0</sub><br>(mm) | D <sub>0</sub><br>(mm) | 包装数/リール(個)<br>Quantity/Reel (pcs)  |       |       |
|--------------------|---------------------|-----------|-----------|-----------|------------------------|------------------------|------------------------|------------------------|------------------------------------|-------|-------|
|                    |                     |           |           |           |                        |                        |                        |                        | φ 180                              | φ 330 |       |
| 29                 | 1.6×0.8             | 8.0±0.3   | 3.5±0.05  | 1.75±0.05 | 4.0±0.1                | 2.0±0.05               | 4.0±0.1                | φ 1.55±0.03            | 5,000                              | -     |       |
| 31                 | 2.0×1.25            |           |           |           |                        |                        |                        |                        |                                    |       |       |
| 52                 | 3.2×1.6             |           |           | 1.75±0.1  | 8.0±0.1                |                        |                        | 12.0±0.1               | φ 1.5±0.1                          | 2,000 | -     |
| 44E                | 7.3×5.8             | 12±0.3    | 5.5±005   |           |                        |                        |                        |                        | φ 1.5 <sup>+0.1</sup> <sub>0</sub> | 500   | 1,500 |
| 59F                | 11.0×7.3            | 24±0.3    | 11.5±005  |           |                        |                        |                        |                        |                                    | -     | 500   |

テーピング寸法/Tape dimensions

送り穴  
Feed hole

φ D

部品装着くぼみ穴  
Pocket

引き出し方向  
Tape running direction

リール寸法/Reel dimensions

φ 180又はφ 330  
(φ 180 or φ 330)

単位[mm]  
unit[mm]

チップタンタルコンデンサ テーピング形状記号  
Chip Tantalum Capacitors Tape code

| φ 180リール<br>φ 180Reel | φ 330リール<br>φ 330Reel | 極性<br>Anode notation  |
|-----------------------|-----------------------|-----------------------|
| L                     | P                     | 送り穴側 +<br>Feed hole + |
| R                     | N                     | 送り穴側 -<br>Feed hole - |