

No.P-251-E034/1  
DATE 2025-11

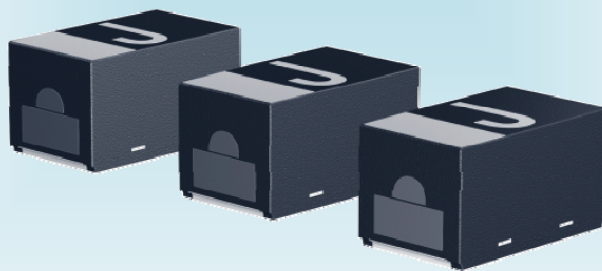
# PRODUCTS DATA SHEET

Face-down terminal structure

## TANTALUM SOLID ELECTROLYTIC CAPACITOR

Type 251

RoHS COMPLIANT  
LEAD FREE



### Granted Patents

Japanese patent (No.5181236)

United States patent (No.8000086)

Korea patent (No.1554195)



**MATSUO ELECTRIC CO., LTD.**

## TYPE 251

To meet the users' demands for smaller and high-function portable information devices, we developed compact and low profile tantalum capacitors with appropriately designed mounting area for high-density mounting ahead of other companies. The capacitors are widely used in portable information and telecommunication equipment, such as mobile phones, smart phones, hearing aids and high functionally compact portable devices. The tantalum capacitors designed for high-density mounting will considerably contribute to miniaturization and improvement of performance of these portable multimedia devices.

## FEATURES

1. Using the face-down terminal structure makes it possible to design the land in almost the same size as the terminal. As the result of this, parts can be downsized, and the mounting area can be reduced to 1/2 to 1/3 of that required by conventional structures.
2. Type 251 in size 1005 to 3216 are applicable to a wide capacitance range from 0.47 to 330  $\mu\text{F}$ .
3. This type of capacitors is suitable for ultra miniaturized, such as DVC, DSC, SSD, smart phones, hearing aids and high functionally compact portable devices.
4. Case M (face-down terminal type 1608) and case S (face-down terminal type 2012) of this type are listed in the Surface Mounting Device-Outline Registration System of Electronic Device Registration Center of JEITA.
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.

## RATING

| Item                                                         | Rating                   | Remarks                                                                                                                                |
|--------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Category Temperature Range<br>(Operating Temperature Range)  | -55 ~ +125°C             | <STD,500><br>Rated Temperature +85°C, At 125°C, 2/3 × rated voltage<br><520><br>Rated Temperature +65°C, At 125°C, 1/2 × rated voltage |
| Rated Temperature<br>(Max. Operating Temp. at Rated Voltage) | +85°C, +65°C             |                                                                                                                                        |
| Rated Voltage                                                | 2.0 ~ 35 VDC             | See CATALOG NUMBERS AND RATING                                                                                                         |
| Nominal Capacitance                                          | 0.47 ~ 330 $\mu\text{F}$ |                                                                                                                                        |
| Capacitance Tolerance                                        | ±20%(M), ±10%(K)         |                                                                                                                                        |
| Failure Rate Level                                           | 1%/1000 h                | To be used at derated voltage when temperature.                                                                                        |

## ORDERING INFORMATION

251

M

4001

107

M

R

10M

500

TYPE

SERIES

RATED VOLTAGE

NOMINAL CAPACITANCE

CAPACITANCE TOLERANCE

STYLE OF REELED PACKAGE

CASE CODE

SPECIFICATION NUMBER

(Taping specification)

| Marking | Rated Voltage |
|---------|---------------|
| 2001    | 2VDC          |
| 2501    | 2.5VDC        |
| 3001    | 3VDC          |
| 4001    | 4VDC          |
| 6301    | 6.3VDC        |
| 8001    | 8VDC          |
| 1002    | 10VDC         |
| 1602    | 16VDC         |
| 2002    | 20VDC         |
| 2502    | 25VDC         |
| 3502    | 35VDC         |

| Marking | Nominal Capacitance |
|---------|---------------------|
| 474     | 0.47 $\mu\text{F}$  |
| 684     | 0.68 $\mu\text{F}$  |
| 105     | 1.0 $\mu\text{F}$   |
| 155     | 1.5 $\mu\text{F}$   |
| 225     | 2.2 $\mu\text{F}$   |
| 335     | 3.3 $\mu\text{F}$   |
| 475     | 4.7 $\mu\text{F}$   |
| 685     | 6.8 $\mu\text{F}$   |
| 106     | 10 $\mu\text{F}$    |
| 156     | 15 $\mu\text{F}$    |
| 226     | 22 $\mu\text{F}$    |
| 336     | 33 $\mu\text{F}$    |
| 476     | 47 $\mu\text{F}$    |
| 686     | 68 $\mu\text{F}$    |
| 107     | 100 $\mu\text{F}$   |
| 157     | 150 $\mu\text{F}$   |
| 227     | 220 $\mu\text{F}$   |
| 337     | 330 $\mu\text{F}$   |

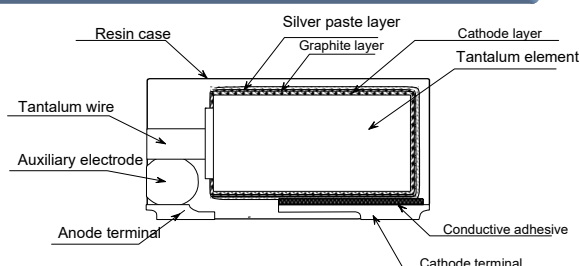
| Capacitance Tolerance | Marking |
|-----------------------|---------|
| $\pm 20\%$            | M       |
| $\pm 10\%$            | K       |

| Anode Notation | Reel Size  | Code |
|----------------|------------|------|
| Feed hole: —   | $\phi$ 180 | R    |

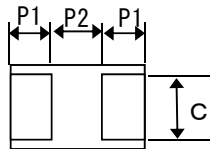
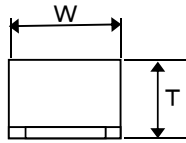
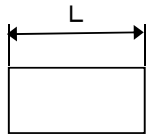
| Case Code | Max. height | Case Size |
|-----------|-------------|-----------|
| 06U       | 0.6         | 1005      |
| 09M       | 0.9         | 1608      |
| 10M       | 1.0         | 1608      |
| 10S       | 1.0         | 2012      |
| 12S       | 1.2         | 2012      |
| 13S       | 1.3         | 2012      |
| 10A       | 1.0         | 3216      |
| 12A       | 1.2         | 3216      |
| 13A       | 1.3         | 3216      |

| Specification Number | Specification Contents  |
|----------------------|-------------------------|
| Blanks               | Rated Temperature +85°C |
| 500                  | Rated Temperature +85°C |
| 520                  | Rated Temperature +65°C |

## STRUCTURE(TYPICAL)



## DIMENSIONS



[U case]

(mm)

| Case Code | Max. height | L                | W                | T ±0.05 | P1 ±0.1 | P2 ±0.1 | C ±0.1 |
|-----------|-------------|------------------|------------------|---------|---------|---------|--------|
| 06U       | 0.6         | 1.05 +0.15/-0.05 | 0.55 +0.15/-0.05 | 0.55    | 0.35    | 0.45    | 0.4    |

[M case]

(mm)

| Case Code | Max. height | L           | W            | T ±0.1 | P1 ±0.1 | P2 ±0.1 | C          |
|-----------|-------------|-------------|--------------|--------|---------|---------|------------|
| 09M       | 0.9         | 1.6 +0.2/-0 | 0.85 +0.2/-0 | 0.8    | 0.5     | 0.75    | 0.65 ±0.07 |

[S case]

(mm)

| Case Code | Max. height | L ±0.1 | W ±0.1 | T ±0.1 | P1 ±0.1 | P2 ±0.1 | C ±0.1 |
|-----------|-------------|--------|--------|--------|---------|---------|--------|
| 10S       | 1.0         | 2.0    | 1.25   | 0.9    | 0.5     | 1.05    | 0.9    |
| 12S       | 1.2         | 2.0    | 1.25   | 1.1    | 0.5     | 1.05    | 0.9    |
| 13S       | 1.3         | 2.0    | 1.25   | 1.2    | 0.5     | 1.05    | 0.9    |

[A case]

(mm)

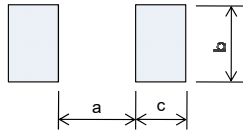
| Case Code | Max. height | L ±0.1 | W ±0.1 | T ±0.1 | P1 ±0.1 | P2 ±0.1 | C ±0.1 |
|-----------|-------------|--------|--------|--------|---------|---------|--------|
| 10A       | 1.0         | 3.2    | 1.6    | 0.9    | 0.8     | 1.65    | 1.2    |
| 12A       | 1.2         | 3.2    | 1.6    | 1.1    | 0.8     | 1.65    | 1.2    |
| 13A       | 1.3         | 3.2    | 1.6    | 1.2    | 0.8     | 1.65    | 1.2    |

[SPECIFICATION NUMBER 500/520 PRODUC ※Dimensional Tolerance of Specification Number 500/520 is as below. (mm)

| Case Code | Max. height | L                | W                | T          | P1 ±0.1 | P2 ±0.1 | C          |
|-----------|-------------|------------------|------------------|------------|---------|---------|------------|
| 06U       | 0.6         | 1.05 +0.15/-0.05 | 0.55 +0.15/-0.05 | 0.55 ±0.05 | 0.35    | 0.45    | 0.4 ±0.1   |
| 09M       | 0.9         | 1.6 +0.2/-0      | 0.85 +0.2/-0     | 0.8 ±0.1   | 0.5     | 0.75    | 0.65 ±0.07 |
| 10M       | 1.0         | 1.6 +0.2/-0      | 0.85 +0.2/-0     | 0.9 ±0.1   | 0.5     | 0.75    | 0.65 ±0.07 |
| 09S       | 0.9         | 2.0 +0.2/-0      | 1.25 +0.2/-0     | 0.8 ±0.1   | 0.5     | 1.15    | 0.9 ±0.1   |
| 10S       | 1.0         | 2.0 +0.2/-0      | 1.25 +0.2/-0     | 0.9 ±0.1   | 0.5     | 1.15    | 0.9 ±0.1   |

※Product height is difference depending on the description. Please refer to "CATALOG NUMBER AND RATING "for the details.

## RECOMMENDED SOLDER PAD LAYOUT



| Case Code                       | Case Size | a      | b    | c    | Mask Thickness |
|---------------------------------|-----------|--------|------|------|----------------|
| 06U                             | 1005      | 0.35 ≤ | 0.3  | 0.45 | ≤100 μm        |
| 06U (Spec. Number 500)          |           |        |      |      |                |
| 09M                             | 1608      | 0.60 ≤ | 0.65 | 0.65 | ≤100 μm        |
| 09M, 10M (Spec. Number 500/520) |           |        |      |      |                |
| 10S, 12S, 13S                   | 2012      | 0.50 ≤ | 0.8  | 1.05 | ≤100 μm        |
| 09S, 10S (Spec. Number 500)     |           |        |      | 1.15 |                |
| 10A, 12A, 13A                   | 3216      | 0.80 ≤ | 1.1  | 1.65 | ≤100 μm        |

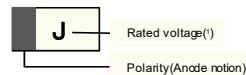
In order to expect the self alignment effect, it is recommended that land width is almost the same size as terminal of capacitor, and space between lands (c) nearly equal to the space between terminals for appropriate soldering.

## MARKING

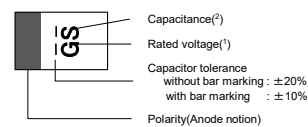
[U case]



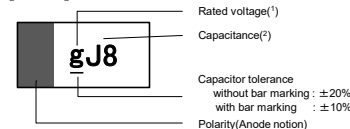
[M case]



[S case]



[A case]



(<sup>1</sup>) Rated voltage is indicated with one alphabetic letter.

| Rated voltage (VDC) | 2.5 | 4 | 6.3 | 8 | 10 | 16 | 20 | 25 | 35 |
|---------------------|-----|---|-----|---|----|----|----|----|----|
| M case, S case      | e   | G | J   | K | A  | C  | D  | E  | V  |
| A case              | e   | g | j   | k | A  | C  | D  | E  | V  |

(<sup>2</sup>) Capacitance is shown by the code below.

| Capacitance (μF) | 1.0 | 1.5 | 2.2 | 3.3 | 4.7 | 6.8 | 10 | 15 | 22 | 33 | 47 | 68 | 100 | 150 | 220 | 330 |
|------------------|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|-----|-----|-----|-----|
| S case           | A   | E   | J   | N   | S   | W   | A  | E  | J  | N  | S  | W  | A   | E   | J   | N   |
| A case           | A6  | E6  | J6  | N6  | S6  | W6  | A7 | E7 | J7 | N7 | S7 | W7 | A8  | E8  | J8  | N8  |

[U case]

| R.V.<br>Cap. | 2   | 2.5 | 3   | 4   | 6.3 | 10  | 16 | 20 | 25 | 35 |
|--------------|-----|-----|-----|-----|-----|-----|----|----|----|----|
| 0.47         |     |     |     |     |     | 06U |    |    |    |    |
| 0.68         |     |     |     |     |     |     |    |    |    |    |
| 1            |     |     |     |     |     | 06U |    |    |    |    |
| 1.5          |     |     |     |     |     |     |    |    |    |    |
| 2.2          |     |     |     |     |     | 06U |    |    |    |    |
| 3.3          |     |     |     |     |     |     |    |    |    |    |
| 4.7          |     |     |     | 06U |     | 06U |    |    |    |    |
| 6.8          |     |     |     |     |     |     |    |    |    |    |
| 10           | 06U |     |     | 06U |     |     |    |    |    |    |
| 15           |     |     | 06U |     |     |     |    |    |    |    |
| 22           |     |     | 06U | 06U |     |     |    |    |    |    |

[M case]

| R.V.<br>Cap. | 2 | 2.5 | 3 | 4   | 6.3 | 10  | 16  | 20 | 25 | 35 |
|--------------|---|-----|---|-----|-----|-----|-----|----|----|----|
| 0.47         |   |     |   |     |     |     | 09M |    |    |    |
| 0.68         |   |     |   |     |     |     |     |    |    |    |
| 1            |   |     |   |     |     |     | 09M |    |    |    |
| 1.5          |   |     |   |     |     |     | 09M |    |    |    |
| 2.2          |   |     |   |     |     |     | 09M |    |    |    |
| 3.3          |   |     |   |     |     |     | 09M |    |    |    |
| 4.7          |   |     |   |     |     | 09M | 09M |    |    |    |
| 6.8          |   |     |   |     |     | 09M |     |    |    |    |
| 10           |   |     |   |     |     | 09M |     |    |    |    |
| 15           |   |     |   |     |     | 09M |     |    |    |    |
| 22           |   |     |   | 09M | 09M |     |     |    |    |    |
| 33           |   |     |   |     | 09M |     |     |    |    |    |
| 47           |   |     |   | 09M |     |     |     |    |    |    |

[S case]

| R.V.<br>Cap. | 2 | 2.5 | 3 | 4       | 6.3     | 10      | 16      | 20  | 25  | 35  |
|--------------|---|-----|---|---------|---------|---------|---------|-----|-----|-----|
| 1            |   |     |   |         |         |         |         | 12S | 12S | 12S |
| 1.5          |   |     |   |         |         |         |         |     |     |     |
| 2.2          |   |     |   |         |         |         |         | 12S |     |     |
| 3.3          |   |     |   |         |         |         |         |     |     |     |
| 4.7          |   |     |   |         |         | 12S     |         |     |     |     |
| 6.8          |   |     |   |         |         |         | 12S     |     |     |     |
| 10           |   |     |   |         |         | 10S,12S | 10S,12S |     |     |     |
| 15           |   |     |   |         |         | 12S     | 13S     |     |     |     |
| 22           |   |     |   |         | 12S     | 10S,12S |         |     |     |     |
| 33           |   |     |   |         | 12S     | 10S,13S |         |     |     |     |
| 47           |   |     |   | 12S     | 10S,12S | 10S,13S |         |     |     |     |
| 68           |   |     |   |         | 12S     |         |         |     |     |     |
| 100          |   | 10S |   | 10S     | 13S     |         |         |     |     |     |
| 150          |   |     |   |         |         |         |         |     |     |     |
| 220          |   |     |   | 12S,13S |         |         |         |     |     |     |

[A case]

| R.V.<br>Cap. | 2 | 2.5 | 3 | 4       | 6.3     | 10      | 16  | 20 | 25  | 35      |
|--------------|---|-----|---|---------|---------|---------|-----|----|-----|---------|
| 2.2          |   |     |   |         |         |         |     |    |     | 10A,12A |
| 3.3          |   |     |   |         |         |         |     |    | 12A |         |
| 4.7          |   |     |   |         |         |         |     |    | 10A |         |
| 6.8          |   |     |   |         |         |         |     |    |     |         |
| 10           |   |     |   |         |         |         |     |    |     |         |
| 15           |   |     |   |         |         |         |     |    |     |         |
| 22           |   |     |   |         |         |         | 13A |    |     |         |
| 33           |   |     |   |         |         |         |     |    |     |         |
| 47           |   |     |   |         |         | 10A,12A |     |    |     |         |
| 68           |   |     |   |         | 10A     | 13A     |     |    |     |         |
| 100          |   |     |   |         | 10A,12A |         |     |    |     |         |
| 150          |   |     |   |         | 10A     |         |     |    |     |         |
| 220          |   |     |   | 10A,12A | 12A     |         |     |    |     |         |
| 330          |   | 12A |   |         |         |         |     |    |     |         |

[SPECIFICATION NUMBER 500 Series]

| R.V.<br>Cap. | 2 | 2.5 | 3   | 4       | 6.3 | 10  | 16 | 20 | 25 | 35 |
|--------------|---|-----|-----|---------|-----|-----|----|----|----|----|
| 22           |   |     |     |         |     | 10M |    |    |    |    |
| 33           |   |     | 06U |         |     |     |    |    |    |    |
| 47           |   |     |     |         | 10M |     |    |    |    |    |
| 68           |   |     |     |         |     |     |    |    |    |    |
| 100          |   | 10M |     | 09M,10M |     |     |    |    |    |    |
| 220          |   |     | 09S | 10S     |     |     |    |    |    |    |

[SPECIFICATION NUMBER 520 Series]

| R.V.<br>Cap. | 2 | 2.5 | 3 | 4   | 6.3 | 10 | 16 | 20 | 25 | 35 |
|--------------|---|-----|---|-----|-----|----|----|----|----|----|
| 150          |   |     |   | 10M |     |    |    |    |    |    |

[Rated Temperature +85°C]

| Catalog number <sup>(1)(2)</sup>       | Rated voltage (VDC) | Surge voltage |       | Capacitance (μF) | Tolerance (±%) | Case code | Lot. (μA) |      |       | Capacitance change (ΔC/C) (%) |       |       | Max. Dissipation factor |       |      |       | ESR Ω 100kHz |
|----------------------------------------|---------------------|---------------|-------|------------------|----------------|-----------|-----------|------|-------|-------------------------------|-------|-------|-------------------------|-------|------|-------|--------------|
|                                        |                     | 85°C          | 125°C |                  |                |           | 20°C      | 85°C | 125°C | -55°C                         | 85°C  | 125°C | -55°C                   | 20°C  | 85°C | 125°C |              |
| 251 M 2001 106 M <sup>-2</sup> 06U     | 2                   | 2.3           | 1.5   | 10               | 20             | 06U       | 0.5       | 5    | 6.3   | -30/0                         | 0/+20 | 0/+20 | 0.45                    | 0.15  | 0.30 | 0.30  | 15           |
| 251 M 2501 107 M <sup>-2</sup> 10M 500 | 2.5                 | 2.8           | 1.9   | 100              | 20             | 10M       | 25        | 250  | 312   | -30/0                         | 0/+15 | 0/+30 | 0.80                    | 0.40  | 0.40 | 0.60  | 2            |
| 251 M 2501 107 M <sup>-2</sup> 10S     | ↓                   | ↓             | ↓     | 100              | 20             | 10S       | 2.5       | 50   | 62    | -30/0                         | 0/+20 | 0/+20 | 0.40                    | 0.20  | 0.30 | 0.30  | 4            |
| 251 M 2501 337 M <sup>-2</sup> 12A     | ↓                   | ↓             | ↓     | 330              | 20             | 12A       | 8.2       | 165  | 206   | -30/0                         | 0/+20 | 0/+20 | 0.60                    | 0.30  | 0.40 | 0.40  | 1            |
| 251 M 3001 156 M <sup>-2</sup> 06U     | 3                   | 3.45          | 2.3   | 15               | 20             | 06U       | 2.3       | 9    | 11    | -30/0                         | 0/+20 | 0/+20 | 0.45                    | 0.15  | 0.30 | 0.30  | 15           |
| 251 M 3001 226 M <sup>-2</sup> 06U     | ↓                   | ↓             | ↓     | 22               | 20             | 06U       | 6.6       | 13.2 | 16.5  | -30/0                         | 0/+20 | 0/+20 | 0.60                    | 0.30  | 0.40 | 0.40  | 15           |
| 251 M 3001 336 M <sup>-2</sup> 06U 500 | ↓                   | ↓             | ↓     | 33               | 20             | 06U       | 9.9       | 99   | 123   | -30/0                         | 0/+15 | 0/+30 | 1.00                    | 0.40  | 0.40 | 0.40  | 10           |
| 251 M 3001 227 M <sup>-2</sup> 09S 500 | ↓                   | ↓             | ↓     | 220              | 20             | 09S       | 66        | 660  | 825   | -30/0                         | 0/+20 | 0/+20 | 0.90                    | 0.60  | 0.60 | 0.60  | 2            |
| 251 M 4001 475 M <sup>-1</sup> 06U     | 4                   | 4.6           | 3     | 4.7              | 10,20          | 06U       | 0.5       | 5    | 6.3   | -30/0                         | 0/+20 | 0/+20 | 0.36                    | 0.12  | 0.24 | 0.24  | 15           |
| 251 M 4001 106 M <sup>-2</sup> 06U     | ↓                   | ↓             | ↓     | 10               | 20             | 06U       | 0.5       | 5    | 6.3   | -30/0                         | 0/+20 | 0/+20 | 0.45                    | 0.15  | 0.30 | 0.30  | 15           |
| 251 M 4001 226 M <sup>-2</sup> 06U     | ↓                   | ↓             | ↓     | 22               | 20             | 06U       | 8.8       | 176  | 220   | -30/0                         | 0/+20 | 0/+20 | 0.60                    | 0.30  | 0.40 | 0.40  | 15           |
| 251 M 4001 226 M <sup>-1</sup> 09M     | ↓                   | ↓             | ↓     | 22               | 10,20          | 09M       | 0.9       | 18   | 22    | -15/0                         | 0/+10 | 0/+15 | 0.30                    | 0.106 | 0.30 | 0.30  | 4            |
| 251 M 4001 476 M <sup>-2</sup> 09M     | ↓                   | ↓             | ↓     | 47               | 20             | 09M       | 1.9       | 38   | 47    | -30/0                         | 0/+20 | 0/+20 | 0.60                    | 0.20  | 0.30 | 0.30  | 4            |
| 251 M 4001 476 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 47               | 20             | 12S       | 1.9       | 38   | 47    | -15/0                         | 0/+10 | 0/+15 | 0.30                    | 0.15  | 0.30 | 0.30  | 4            |
| 251 M 4001 107 M <sup>-2</sup> 09M 500 | ↓                   | ↓             | ↓     | 100              | 20             | 09M       | 80        | 800  | 1000  | -30/0                         | 0/+15 | 0/+20 | 1.00                    | 0.60  | 0.60 | 0.80  | 3            |
| 251 M 4001 107 M <sup>-1</sup> 10M 500 | ↓                   | ↓             | ↓     | 100              | 10,20          | 10M       | 40        | 400  | 500   | -30/0                         | 0/+15 | 0/+20 | 0.80                    | 0.40  | 0.40 | 0.60  | 2            |
| 251 M 4001 107 M <sup>-2</sup> 10S     | ↓                   | ↓             | ↓     | 100              | 20             | 10S       | 4.0       | 80   | 100   | -30/0                         | 0/+20 | 0/+20 | 0.40                    | 0.20  | 0.30 | 0.30  | 4            |
| 251 M 4001 227 M <sup>-2</sup> 10S 500 | ↓                   | ↓             | 3     | 220              | 20             | 10S       | 88        | 880  | 1100  | -30/0                         | 0/+15 | 0/+20 | 0.90                    | 0.60  | 0.60 | 0.60  | 2            |
| 251 M 4001 227 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 220              | 20             | 12S       | 88        | 176  | 220   | -30/0                         | 0/+20 | 0/+20 | 0.80                    | 0.40  | 0.50 | 0.50  | 2            |
| 251 M 4001 227 M <sup>-2</sup> 13S     | ↓                   | ↓             | ↓     | 220              | 20             | 13S       | 44        | 176  | 220   | -30/0                         | 0/+20 | 0/+20 | 0.80                    | 0.40  | 0.50 | 0.50  | 2            |
| 251 M 4001 227 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 220              | 20             | 10A       | 8.8       | 176  | 220   | -30/0                         | 0/+20 | 0/+20 | 0.48                    | 0.24  | 0.30 | 0.30  | 2            |
| 251 M 4001 227 M <sup>-1</sup> 12A     | ↓                   | ↓             | ↓     | 220              | 10,20          | 12A       | 8.8       | 176  | 220   | -30/0                         | 0/+20 | 0/+20 | 0.48                    | 0.24  | 0.30 | 0.30  | 2            |
| 251 M 6301 226 M <sup>-2</sup> 09M     | 6.3                 | 7.2           | 4.8   | 22               | 20             | 09M       | 1.4       | 28   | 35    | -30/0                         | 0/+20 | 0/+20 | 0.40                    | 0.20  | 0.30 | 0.30  | 8            |
| 251 M 6301 226 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 22               | 20             | 12S       | 1.4       | 14   | 17    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15  | 0.30 | 0.30  | 4            |
| 251 M 6301 336 M <sup>-2</sup> 09M     | ↓                   | ↓             | ↓     | 33               | 20             | 09M       | 2.1       | 42   | 52    | -30/0                         | 0/+20 | 0/+20 | 0.40                    | 0.20  | 0.30 | 0.30  | 8            |
| 251 M 6301 336 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 33               | 20             | 12S       | 2.1       | 42   | 52    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15  | 0.30 | 0.30  | 4            |
| 251 M 6301 476 M <sup>-2</sup> 10M 500 | ↓                   | ↓             | ↓     | 47               | 20             | 10M       | 29.7      | 297  | 372   | -30/0                         | 0/+15 | 0/+20 | 0.60                    | 0.30  | 0.30 | 0.40  | 2            |
| 251 M 6301 476 M <sup>-2</sup> 10S     | ↓                   | ↓             | ↓     | 47               | 20             | 10S       | 3.0       | 59   | 74    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15  | 0.30 | 0.30  | 4            |
| 251 M 6301 476 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 47               | 20             | 12S       | 3.0       | 59   | 74    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15  | 0.30 | 0.30  | 4            |
| 251 M 6301 686 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 68               | 20             | 12S       | 4.2       | 85   | 107   | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15  | 0.30 | 0.30  | 0.8          |
| 251 M 6301 686 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 68               | 20             | 10A       | 4.2       | 85   | 107   | -30/0                         | 0/+20 | 0/+20 | 0.32                    | 0.16  | 0.32 | 0.32  | 2            |
| 251 M 6301 107 M <sup>-2</sup> 13S     | ↓                   | ↓             | ↓     | 100              | 20             | 13S       | 6.3       | 126  | 157   | -30/0                         | 0/+20 | 0/+20 | 0.48                    | 0.30  | 0.30 | 0.30  | 2            |
| 251 M 6301 107 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 100              | 20             | 10A       | 6.3       | 126  | 157   | -30/0                         | 0/+20 | 0/+20 | 0.36                    | 0.18  | 0.30 | 0.30  | 2            |
| 251 M 6301 107 M <sup>-2</sup> 12A     | ↓                   | ↓             | ↓     | 100              | 20             | 12A       | 6.3       | 126  | 157   | -30/0                         | 0/+20 | 0/+20 | 0.36                    | 0.18  | 0.30 | 0.30  | 2            |
| 251 M 6301 157 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 150              | 20             | 10A       | 18        | 189  | 237   | -20/0                         | 0/+20 | 0/+25 | 0.80                    | 0.40  | 0.50 | 0.50  | 2            |
| 251 M 6301 227 M <sup>-2</sup> 12A     | ↓                   | ↓             | ↓     | 220              | 20             | 12A       | 69        | 277  | 347   | -15/0                         | 0/+15 | 0/+20 | 0.80                    | 0.30  | 0.30 | 0.40  | 1            |

[Rated Temperature +85°C]

| Catalog number <sup>(1)(2)</sup> | Rated voltage (VDC) | Surge voltage |       | Capacitance (μF) | Tolerance (±%) | Case code | Lct. (μA) |      |       | Capacitance change (ΔC/C) (%) |       |       | Max. Dissipation factor |      |      |       | ESR Ω 100kHz |
|----------------------------------|---------------------|---------------|-------|------------------|----------------|-----------|-----------|------|-------|-------------------------------|-------|-------|-------------------------|------|------|-------|--------------|
|                                  |                     | 85°C          | 125°C |                  |                |           | 20°C      | 85°C | 125°C | -55°C                         | 85°C  | 125°C | -55°C                   | 20°C | 85°C | 125°C |              |
| 251 M 1002 474 _ 1 _ 2 06U       | 10                  | 11.5          | 7.6   | 0.47             | 10,20          | 06U       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.16                    | 0.08 | 0.16 | 0.16  | 30           |
| 251 M 1002 105 _ 1 _ 2 06U       | ↓                   | ↓             | ↓     | 1                | 10,20          | 06U       | 0.5       | 5    | 6.3   | -30/0                         | 0/+20 | 0/+20 | 0.18                    | 0.06 | 0.12 | 0.12  | 15           |
| 251 M 1002 225 M _ 2 06U         | ↓                   | ↓             | ↓     | 2.2              | 20             | 06U       | 0.5       | 5    | 6.3   | -30/0                         | 0/+20 | 0/+20 | 0.18                    | 0.06 | 0.12 | 0.12  | 15           |
| 251 M 1002 475 M _ 2 06U         | ↓                   | ↓             | ↓     | 4.7              | 20             | 06U       | 2.5       | 10   | 12.5  | -30/0                         | 0/+20 | 0/+20 | 0.36                    | 0.12 | 0.24 | 0.24  | 15           |
| 251 M 1002 475 _ 1 _ 2 09M       | ↓                   | ↓             | ↓     | 4.7              | 10,20          | 09M       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.12                    | 0.06 | 0.12 | 0.12  | 10           |
| 251 M 1002 475 _ 1 _ 2 12S       | ↓                   | ↓             | ↓     | 4.7              | 10,20          | 12S       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.15                    | 0.08 | 0.08 | 0.10  | 8            |
| 251 M 1002 685 M _ 2 09M         | ↓                   | ↓             | ↓     | 6.8              | 20             | 09M       | 0.7       | 14   | 17    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.20 | 0.30 | 0.30  | 8            |
| 251 M 1002 106 M _ 2 09M         | ↓                   | ↓             | ↓     | 10               | 20             | 09M       | 1.0       | 20   | 25    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.20 | 0.30 | 0.30  | 8            |
| 251 M 1002 106 M _ 2 10S         | ↓                   | ↓             | ↓     | 10               | 20             | 10S       | 1.0       | 20   | 25    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15 | 0.30 | 0.30  | 4            |
| 251 M 1002 106 M _ 2 12S         | ↓                   | ↓             | ↓     | 10               | 20             | 12S       | 1.0       | 10   | 13    | -15/0                         | 0/+10 | 0/+15 | 0.16                    | 0.08 | 0.16 | 0.16  | 4            |
| 251 M 1002 156 M _ 2 09M         | ↓                   | ↓             | ↓     | 15               | 20             | 09M       | 1.5       | 30   | 38    | -30/0                         | 0/+20 | 0/+20 | 0.60                    | 0.30 | 0.45 | 0.45  | 8            |
| 251 M 1002 156 M _ 2 12S         | ↓                   | ↓             | ↓     | 15               | 20             | 12S       | 1.5       | 15   | 19    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15 | 0.30 | 0.30  | 4            |
| 251 M 1002 226 M _ 2 10M 500     | ↓                   | ↓             | ↓     | 22               | 20             | 10M       | 11        | 110  | 138   | -30/0                         | 0/+15 | 0/+20 | 0.60                    | 0.30 | 0.30 | 0.40  | 2            |
| 251 M 1002 226 M _ 2 10S         | ↓                   | ↓             | ↓     | 22               | 20             | 10S       | 2.2       | 44   | 55    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15 | 0.30 | 0.30  | 4            |
| 251 M 1002 226 M _ 2 12S         | ↓                   | ↓             | ↓     | 22               | 20             | 12S       | 2.2       | 44   | 55    | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15 | 0.30 | 0.30  | 4            |
| 251 M 1002 336 M _ 2 10S         | ↓                   | ↓             | ↓     | 33               | 20             | 10S       | 3.3       | 66   | 82    | -30/0                         | 0/+20 | 0/+20 | 0.40                    | 0.20 | 0.30 | 0.30  | 2            |
| 251 M 1002 336 M _ 2 13S         | ↓                   | ↓             | ↓     | 33               | 20             | 13S       | 3.3       | 66   | 82.5  | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.15 | 0.30 | 0.30  | 4            |
| 251 M 1002 476 M _ 2 10S         | ↓                   | ↓             | ↓     | 47               | 20             | 10S       | 9.4       | 94   | 117   | -30/0                         | 0/+20 | 0/+20 | 0.60                    | 0.24 | 0.40 | 0.40  | 2            |
| 251 M 1002 476 M _ 2 13S         | ↓                   | ↓             | ↓     | 47               | 20             | 13S       | 4.7       | 94   | 117   | -30/0                         | 0/+20 | 0/+20 | 0.60                    | 0.30 | 0.40 | 0.40  | 2            |
| 251 M 1002 476 M _ 2 10A         | ↓                   | ↓             | ↓     | 47               | 20             | 10A       | 4.7       | 94   | 117   | -30/0                         | 0/+20 | 0/+20 | 0.28                    | 0.14 | 0.28 | 0.28  | 2            |
| 251 M 1002 476 M _ 2 12A         | ↓                   | ↓             | ↓     | 47               | 20             | 12A       | 4.7       | 94   | 117   | -30/0                         | 0/+20 | 0/+20 | 0.28                    | 0.14 | 0.28 | 0.28  | 2            |
| 251 M 1002 686 M _ 2 13A         | ↓                   | ↓             | ↓     | 68               | 20             | 13A       | 6.8       | 136  | 170   | -30/0                         | 0/+20 | 0/+20 | 0.30                    | 0.12 | 0.24 | 0.24  | 2            |
| 251 M 1602 474 _ 1 _ 2 09M       | 16                  | 18.4          | 12.2  | 0.47             | 10,20          | 09M       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.16                    | 0.08 | 0.16 | 0.16  | 15           |
| 251 M 1602 105 M _ 2 09M         | ↓                   | ↓             | ↓     | 1                | 20             | 09M       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.16                    | 0.08 | 0.16 | 0.16  | 15           |
| 251 M 1602 155 M _ 2 09M         | ↓                   | ↓             | ↓     | 1.5              | 20             | 09M       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.16                    | 0.08 | 0.16 | 0.16  | 15           |
| 251 M 1602 225 _ 1 _ 2 09M       | ↓                   | ↓             | ↓     | 2.2              | 10,20          | 09M       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.16                    | 0.08 | 0.16 | 0.16  | 15           |
| 251 M 1602 335 M _ 2 09M         | ↓                   | ↓             | ↓     | 3.3              | 20             | 09M       | 0.5       | 5.2  | 6.6   | -15/0                         | 0/+10 | 0/+15 | 0.20                    | 0.10 | 0.20 | 0.20  | 10           |
| 251 M 1602 475 M _ 2 09M         | ↓                   | ↓             | ↓     | 4.7              | 20             | 09M       | 0.8       | 8    | 9.4   | -30/0                         | 0/+20 | 0/+20 | 0.24                    | 0.12 | 0.24 | 0.24  | 10           |
| 251 M 1602 685 M _ 2 12S         | ↓                   | ↓             | ↓     | 6.8              | 20             | 12S       | 1.1       | 22   | 27    | -15/0                         | 0/+10 | 0/+15 | 0.16                    | 0.08 | 0.16 | 0.16  | 2            |
| 251 M 1602 106 M _ 2 10S         | ↓                   | ↓             | ↓     | 10               | 20             | 10S       | 1.6       | 32   | 40    | -30/0                         | 0/+20 | 0/+20 | 0.14                    | 0.10 | 0.10 | 0.12  | 2            |
| 251 M 1602 106 M _ 2 12S         | ↓                   | ↓             | ↓     | 10               | 20             | 12S       | 1.6       | 32   | 40    | -30/0                         | 0/+20 | 0/+20 | 0.14                    | 0.10 | 0.10 | 0.12  | 2            |
| 251 M 1602 156 M _ 2 13S         | ↓                   | ↓             | ↓     | 15               | 20             | 13S       | 2.4       | 48   | 60    | -30/0                         | 0/+20 | 0/+20 | 0.18                    | 0.12 | 0.12 | 0.14  | 1.5          |
| 251 M 1602 226 M _ 2 13A         | ↓                   | ↓             | ↓     | 22               | 20             | 13A       | 3.5       | 70   | 88    | -30/0                         | 0/+15 | 0/+20 | 0.40                    | 0.20 | 0.30 | 0.30  | 2            |
| 251 M 2002 105 M _ 2 12S         | 20                  | 23            | 15.3  | 1                | 20             | 12S       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.10                    | 0.05 | 0.10 | 0.10  | 8            |
| 251 M 2002 225 M _ 2 12S         | ↓                   | ↓             | ↓     | 2.2              | 20             | 12S       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.10                    | 0.05 | 0.10 | 0.10  | 8            |
| 251 M 2502 105 M _ 2 12S         | 25                  | 28.7          | 19.1  | 1                | 20             | 12S       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.12                    | 0.06 | 0.12 | 0.12  | 6            |
| 251 M 2502 335 M _ 2 12A         | ↓                   | ↓             | ↓     | 3.3              | 20             | 12A       | 0.8       | 8    | 10    | -15/0                         | 0/+10 | 0/+15 | 0.12                    | 0.06 | 0.12 | 0.12  | 6            |
| 251 M 2502 475 M _ 2 10A         | ↓                   | ↓             | ↓     | 4.7              | 20             | 10A       | 1.2       | 12   | 15    | -15/0                         | 0/+10 | 0/+15 | 0.12                    | 0.06 | 0.12 | 0.12  | 4            |
| 251 M 3502 105 M _ 2 12S         | 35                  | 40.2          | 26.8  | 1                | 20             | 12S       | 0.5       | 5    | 6.3   | -15/0                         | 0/+10 | 0/+15 | 0.10                    | 0.05 | 0.10 | 0.10  | 8            |
| 251 M 3502 225 M _ 2 10A         | ↓                   | ↓             | ↓     | 2.2              | 20             | 10A       | 0.8       | 8    | 9.6   | -15/0                         | 0/+10 | 0/+15 | 0.12                    | 0.06 | 0.12 | 0.12  | 6            |
| 251 M 3502 225 M _ 2 12A         | ↓                   | ↓             | ↓     | 2.2              | 20             | 12A       | 0.8       | 8    | 9.6   | -15/0                         | 0/+10 | 0/+15 | 0.12                    | 0.06 | 0.12 | 0.12  | 6            |

Note1 : Catalog number<sup>(1)</sup>: For Capacitance Tolerance, insert "K" or "M" into \_1.

Note2 : Catalog number<sup>(2)</sup>: For Reeled Package, insert "R" into \_2.

Note3 : Lct.<sup>(3)</sup>: A=Shall not exceed the value of initial specification., B=Shall not exceed 2 times the value of initial specification. , C=Shall not exceed 4 times the value of initial specification. , D=Shall not exceed 5 times the value of initial specification. , E=Shall not exceed 20 times the value of initial specification.

Note4 : DF<sup>(4)</sup>: A=Shall not exceed the value of initial specification., B=Shall not exceed 1.5 times the value of initial specification.,C=Shall not exceed 2 times the value of initial specification.

[Rated Temperature +65°C]

| Catalog number <sup>(1)(2)</sup> | Rated voltage (VDC) | Surge voltage |       | Capacitance (μF) | Tolerance (±%) | Case code | Lct. (μA) |      |       | Capacitance change (ΔC/C) (%) |       |       | Max. Dissipation factor |      |      |       | ESR Ω 100kHz |
|----------------------------------|---------------------|---------------|-------|------------------|----------------|-----------|-----------|------|-------|-------------------------------|-------|-------|-------------------------|------|------|-------|--------------|
|                                  |                     | 65°C          | 125°C |                  |                |           | 20°C      | 65°C | 125°C | -55°C                         | 65°C  | 125°C | -55°C                   | 20°C | 65°C | 125°C |              |
| 251 M 4001 157 _ 1 _ 2 10M 520   | 4                   | 4.6           | 2.3   | 150              | 20             | 10M       | 120       | 1200 | 1500  | -30/0                         | 0/+15 | 0/+20 | 0.90                    | 0.60 | 0.60 | 0.60  | 2            |

Note1 : Catalog number<sup>(1)</sup>: For Capacitance Tolerance, insert "K" or "M" into \_1.

Note2 : Catalog number<sup>(2)</sup>: For Reeled Package, insert "R" into \_2.

Note3 : Lct.<sup>(3)</sup>: A=Shall not exceed the value of initial specification., B=Shall not exceed 2 times the value of initial specification. , C=Shall not exceed 4 times the value of initial specification. , D=Shall not exceed 5 times the value of initial specification. , E=Shall not exceed 20 times the value of initial specification.

Note4 : DF<sup>(4)</sup>: A=Shall not exceed the value of initial specification., B=Shall not exceed 1.5 times the value of initial specification.,C=Shall not exceed 2 times the value of initial specification.

## CATALOG NUMBERS AND RATING ②

[Rated Temperature +85°C]

| Catalog number <sup>(1)(2)</sup>       | Rated voltage (VDC) | Surge voltage |       | Capacitance (μF) | Tolerance (±%) | Case code | Surge               |       |                   | Resistance to soldering heat |       |                   | Rapid change of temp.&Damp heat |       |                   | Endurance           |       |                   |
|----------------------------------------|---------------------|---------------|-------|------------------|----------------|-----------|---------------------|-------|-------------------|------------------------------|-------|-------------------|---------------------------------|-------|-------------------|---------------------|-------|-------------------|
|                                        |                     | 85°C          | 125°C |                  |                |           | Lct. <sup>(3)</sup> | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup>          | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup>             | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup> | ΔC/C% | DF <sup>(4)</sup> |
| 251 M 2001 106 M <sup>-2</sup> 06U     | 2                   | 2.3           | 1.5   | 10               | 20             | 06U       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 2501 107 M <sup>-2</sup> 10M 500 | 2.5                 | 2.8           | 1.9   | 100              | 20             | 10M       | B                   | ±30   | C                 | B                            | ±30   | C                 | B                               | ±30   | C                 | B                   | ±30   | C                 |
| 251 M 2501 107 M <sup>-2</sup> 10S     | ↓                   | ↓             | ↓     | 100              | 20             | 10S       | B                   | ±20   | A                 | A                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 2501 337 M <sup>-2</sup> 12A     | ↓                   | ↓             | ↓     | 330              | 20             | 12A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 3001 156 M <sup>-2</sup> 06U     | 3                   | 3.45          | 2.3   | 15               | 20             | 06U       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 3001 226 M <sup>-2</sup> 06U     | ↓                   | ↓             | ↓     | 22               | 20             | 06U       | B                   | ±40   | A                 | B                            | ±40   | A                 | B                               | ±40   | B                 | B                   | ±40   | B                 |
| 251 M 3001 336 M <sup>-2</sup> 06U 500 | ↓                   | ↓             | ↓     | 33               | 20             | 06U       | B                   | ±30   | C                 | B                            | ±30   | C                 | B                               | ±30   | C                 | C                   | ±30   | C                 |
| 251 M 3001 227 M <sup>-2</sup> 09S 500 | ↓                   | ↓             | ↓     | 220              | 20             | 09S       | B                   | ±40   | B                 | B                            | ±30   | B                 | B                               | ±30   | B                 | B                   | ±40   | B                 |
| 251 M 4001 475 <sup>-1-2</sup> 06U     | 4                   | 4.6           | 3     | 4.7              | 10,20          | 06U       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 4001 106 M <sup>-2</sup> 06U     | ↓                   | ↓             | ↓     | 10               | 20             | 06U       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 4001 226 M <sup>-2</sup> 06U     | ↓                   | ↓             | ↓     | 22               | 20             | 06U       | B                   | ±40   | A                 | D                            | ±40   | B                 | B                               | ±40   | B                 | D                   | ±40   | B                 |
| 251 M 4001 226 <sup>-1-2</sup> 09M     | ↓                   | ↓             | ↓     | 22               | 10,20          | 09M       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 4001 476 M <sup>-2</sup> 09M     | ↓                   | ↓             | ↓     | 47               | 20             | 09M       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 4001 476 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 47               | 20             | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 4001 107 M <sup>-2</sup> 09M 500 | ↓                   | ↓             | ↓     | 100              | 20             | 09M       | B                   | ±30   | C                 | B                            | ±30   | C                 | B                               | ±30   | C                 | B                   | ±30   | C                 |
| 251 M 4001 107 <sup>-1-2</sup> 10M 500 | ↓                   | ↓             | ↓     | 100              | 10,20          | 10M       | B                   | ±30   | C                 | B                            | ±30   | C                 | B                               | ±30   | C                 | B                   | ±30   | C                 |
| 251 M 4001 107 M <sup>-2</sup> 10S     | ↓                   | ↓             | ↓     | 100              | 20             | 10S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 4001 227 M <sup>-2</sup> 10S 500 | ↓                   | ↓             | 3     | 220              | 20             | 10S       | B                   | ±30   | B                 | B                            | ±30   | B                 | B                               | ±30   | B                 | B                   | ±30   | B                 |
| 251 M 4001 227 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 220              | 20             | 12S       | B                   | ±40   | A                 | B                            | ±40   | B                 | B                               | ±40   | B                 | B                   | ±40   | B                 |
| 251 M 4001 227 M <sup>-2</sup> 13S     | ↓                   | ↓             | ↓     | 220              | 20             | 13S       | B                   | ±40   | A                 | B                            | ±40   | A                 | B                               | ±40   | B                 | B                   | ±40   | B                 |
| 251 M 4001 227 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 220              | 20             | 10A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 4001 227 <sup>-1-2</sup> 12A     | ↓                   | ↓             | ↓     | 220              | 10,20          | 12A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 226 M <sup>-2</sup> 09M     | 6.3                 | 7.2           | 4.8   | 22               | 20             | 09M       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 226 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 22               | 20             | 12S       | A                   | ±20   | A                 | A                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 336 M <sup>-2</sup> 09M     | ↓                   | ↓             | ↓     | 33               | 20             | 09M       | B                   | ±30   | A                 | B                            | ±30   | A                 | B                               | ±30   | B                 | B                   | ±30   | B                 |
| 251 M 6301 336 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 33               | 20             | 12S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 476 M <sup>-2</sup> 10M 500 | ↓                   | ↓             | ↓     | 47               | 20             | 10M       | B                   | ±30   | C                 | B                            | ±30   | C                 | B                               | ±30   | C                 | B                   | ±30   | C                 |
| 251 M 6301 476 M <sup>-2</sup> 10S     | ↓                   | ↓             | ↓     | 47               | 20             | 10S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 476 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 47               | 20             | 12S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 686 M <sup>-2</sup> 12S     | ↓                   | ↓             | ↓     | 68               | 20             | 12S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 686 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 68               | 20             | 10A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 107 M <sup>-2</sup> 13S     | ↓                   | ↓             | ↓     | 100              | 20             | 13S       | B                   | ±20   | A                 | B                            | ±30   | A                 | B                               | ±20   | B                 | B                   | ±35   | B                 |
| 251 M 6301 107 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 100              | 20             | 10A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 107 M <sup>-2</sup> 12A     | ↓                   | ↓             | ↓     | 100              | 20             | 12A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 6301 157 M <sup>-2</sup> 10A     | ↓                   | ↓             | ↓     | 150              | 20             | 10A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | D                   | ±30   | B                 |
| 251 M 6301 227 M <sup>-2</sup> 12A     | ↓                   | ↓             | ↓     | 220              | 20             | 12A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |

[Rated Temperature +85°C]

| Catalog number <sup>(1)(2)</sup> | Rated voltage (VDC) | Surge voltage |       | Capacitance (μF) | Tolerance (±%) | Case code | Surge               |       |                   | Resistance to soldering heat |       |                   | Rapid change of temp.&Damp heat |       |                   | Endurance           |       |                   |
|----------------------------------|---------------------|---------------|-------|------------------|----------------|-----------|---------------------|-------|-------------------|------------------------------|-------|-------------------|---------------------------------|-------|-------------------|---------------------|-------|-------------------|
|                                  |                     | 85°C          | 125°C |                  |                |           | Lct. <sup>(3)</sup> | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup>          | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup>             | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup> | ΔC/C% | DF <sup>(4)</sup> |
| 251 M 1002 474 _1_2 06U          | 10                  | 11.5          | 7.6   | 0.47             | 10,20          | 06U       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1002 105 _1_2 06U          | ↓                   | ↓             | ↓     | 1                | 10,20          | 06U       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 225 M_2 06U           | ↓                   | ↓             | ↓     | 2.2              | 20             | 06U       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 475 M_2 06U           | ↓                   | ↓             | ↓     | 4.7              | 20             | 06U       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 475 _1_2 09M          | ↓                   | ↓             | ↓     | 4.7              | 10,20          | 09M       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1002 475 _1_2 12S          | ↓                   | ↓             | ↓     | 4.7              | 10,20          | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1002 685 M_2 09M           | ↓                   | ↓             | ↓     | 6.8              | 20             | 09M       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 106 M_2 09M           | ↓                   | ↓             | ↓     | 10               | 20             | 09M       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 106 M_2 10S           | ↓                   | ↓             | ↓     | 10               | 20             | 10S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 106 M_2 12S           | ↓                   | ↓             | ↓     | 10               | 20             | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1002 156 M_2 09M           | ↓                   | ↓             | ↓     | 15               | 20             | 09M       | B                   | ±30   | A                 | B                            | ±30   | A                 | B                               | ±30   | B                 | B                   | ±30   | B                 |
| 251 M 1002 156 M_2 12S           | ↓                   | ↓             | ↓     | 15               | 20             | 12S       | A                   | ±20   | A                 | A                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 226 M_2 10M 500       | ↓                   | ↓             | ↓     | 22               | 20             | 10M       | B                   | ±30   | C                 | B                            | ±30   | C                 | B                               | ±30   | C                 | B                   | ±30   | C                 |
| 251 M 1002 226 M_2 10S           | ↓                   | ↓             | ↓     | 22               | 20             | 10S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 226 M_2 12S           | ↓                   | ↓             | ↓     | 22               | 20             | 12S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 336 M_2 10S           | ↓                   | ↓             | ↓     | 33               | 20             | 10S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 336 M_2 13S           | ↓                   | ↓             | ↓     | 33               | 20             | 13S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 476 M_2 10S           | ↓                   | ↓             | ↓     | 47               | 20             | 10S       | B                   | ±20   | A                 | B                            | ±20   | B                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 476 M_2 13S           | ↓                   | ↓             | ↓     | 47               | 20             | 13S       | B                   | ±30   | A                 | B                            | ±30   | B                 | B                               | ±30   | B                 | B                   | ±30   | B                 |
| 251 M 1002 476 M_2 10A           | ↓                   | ↓             | ↓     | 47               | 20             | 10A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 476 M_2 12A           | ↓                   | ↓             | ↓     | 47               | 20             | 12A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1002 686 M_2 13A           | ↓                   | ↓             | ↓     | 68               | 20             | 13A       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1602 474 _1_2 09M          | 16                  | 18.4          | 12.2  | 0.47             | 10,20          | 09M       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1602 105 M_2 09M           | ↓                   | ↓             | ↓     | 1                | 20             | 09M       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1602 155 M_2 09M           | ↓                   | ↓             | ↓     | 1.5              | 20             | 09M       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1602 225 _1_2 09M          | ↓                   | ↓             | ↓     | 2.2              | 10,20          | 09M       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1602 335 M_2 09M           | ↓                   | ↓             | ↓     | 3.3              | 20             | 09M       | A                   | ±20   | A                 | A                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±20   | B                 |
| 251 M 1602 475 M_2 09M           | ↓                   | ↓             | ↓     | 4.7              | 20             | 09M       | B                   | ±30   | A                 | B                            | ±30   | A                 | B                               | ±30   | B                 | E                   | ±30   | B                 |
| 251 M 1602 685 M_2 12S           | ↓                   | ↓             | ↓     | 6.8              | 20             | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 1602 106 M_2 10S           | ↓                   | ↓             | ↓     | 10               | 20             | 10S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1602 106 M_2 12S           | ↓                   | ↓             | ↓     | 10               | 20             | 12S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1602 156 M_2 13S           | ↓                   | ↓             | ↓     | 15               | 20             | 13S       | B                   | ±20   | A                 | B                            | ±20   | A                 | B                               | ±20   | B                 | B                   | ±30   | B                 |
| 251 M 1602 226 M_2 13A           | ↓                   | ↓             | ↓     | 22               | 20             | 13A       | B                   | ±30   | A                 | B                            | ±30   | B                 | B                               | ±30   | B                 | B                   | ±30   | B                 |
| 251 M 2002 105 M_2 12S           | 20                  | 23            | 15.3  | 1                | 20             | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 2002 225 M_2 12S           | ↓                   | ↓             | ↓     | 2.2              | 20             | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 2502 105 M_2 12S           | 25                  | 28.7          | 19.1  | 1                | 20             | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 2502 335 M_2 12A           | ↓                   | ↓             | ↓     | 3.3              | 20             | 12A       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 2502 475 M_2 10A           | ↓                   | ↓             | ↓     | 4.7              | 20             | 10A       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 3502 105 M_2 12S           | 35                  | 40.2          | 26.8  | 1                | 20             | 12S       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 3502 225 M_2 10A           | ↓                   | ↓             | ↓     | 2.2              | 20             | 10A       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |
| 251 M 3502 225 M_2 12A           | ↓                   | ↓             | ↓     | 2.2              | 20             | 12A       | A                   | ±15   | A                 | A                            | ±15   | A                 | B                               | ±15   | B                 | B                   | ±15   | B                 |

Note1 : Catalog number<sup>(1)</sup>: For Capacitance Tolerance, insert "K" or "M" into \_1.

Note2 : Catalog number<sup>(2)</sup>: For Reeled Package, insert "R" into \_2.

Note3 : Lct.<sup>(3)</sup> : A=Shall not exceed the value of initial specification., B=Shall not exceed 2 times the value of initial specification. , C=Shall not exceed 4 times the value of initial specification. , D=Shall not exceed 5 times the value of initial specification. , E=Shall not exceed 20 times the value of initial specification.

Note4 : DF<sup>(4)</sup> : A=Shall not exceed the value of initial specification., B=Shall not exceed 1.5 times the value of initial specification., C=Shall not exceed 2 times the value of initial specification.

[Rated Temperature +65°C]

| Catalog number <sup>(1)(2)</sup> | Rated voltage (VDC) | Surge voltage |       | Capacitance (μF) | Tolerance (±%) | Case code | Surge               |       |                   | Resistance to soldering heat |       |                   | Rapid change of temp.&Damp heat |       |                   | 65°C Endurance      |       |                   | 125°C Endurance     |       |                   |
|----------------------------------|---------------------|---------------|-------|------------------|----------------|-----------|---------------------|-------|-------------------|------------------------------|-------|-------------------|---------------------------------|-------|-------------------|---------------------|-------|-------------------|---------------------|-------|-------------------|
|                                  |                     | 65°C          | 125°C |                  |                |           | Lct. <sup>(3)</sup> | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup>          | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup>             | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup> | ΔC/C% | DF <sup>(4)</sup> | Lct. <sup>(3)</sup> | ΔC/C% | DF <sup>(4)</sup> |
| 251 M 4001 157 _1_2 10M 520      | 4                   | 4.6           | 2.3   | 150              | 20             | 10M       | D                   | ±30   | B                 | D                            | ±30   | B                 | D                               | ±30   | B                 | D                   | ±30   | B                 | D                   | ±50   | B                 |

Note1 : Catalog number<sup>(1)</sup>: For Capacitance Tolerance, insert "K" or "M" into \_1.

Note2 : Catalog number<sup>(2)</sup>: For Reeled Package, insert "R" into \_2.

Note3 : Lct.<sup>(3)</sup> : A=Shall not exceed the value of initial specification. , B=Shall not exceed 2 times the value of initial specification. , C=Shall not exceed 4 times the value of initial specification. , D=Shall not exceed 5 times the value of initial specification. , E=Shall not exceed 20 times the value of initial specification.

Note4 : DF<sup>(4)</sup> : A=Shall not exceed the value of initial specification., B=Shall not exceed 1.5 times the value of initial specification., C=Shall not exceed 2 times the value of initial specification.

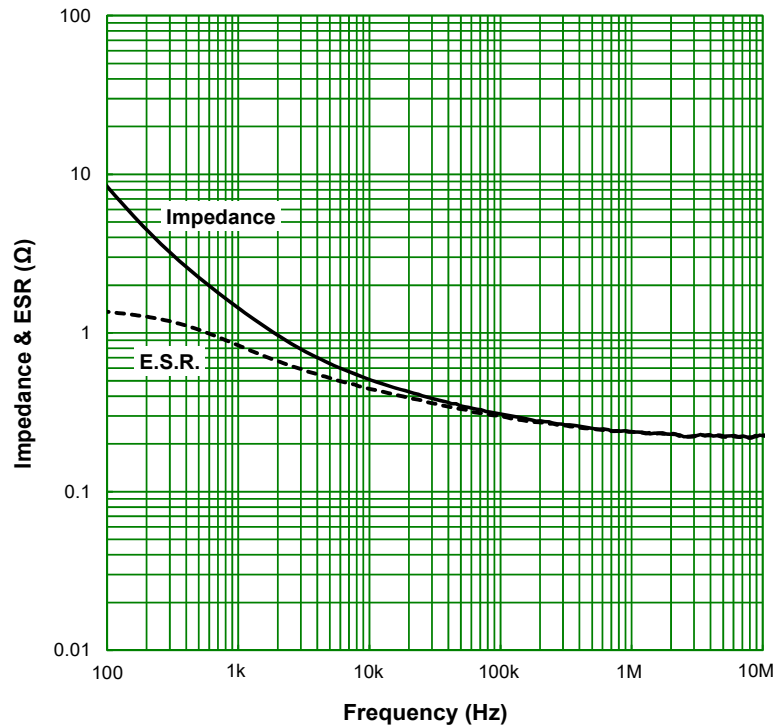
## PERFORMANCE

| No | Item                                         |                                                                           | Performanc                                                                                                                                                                                                                       | Test method                                                                                                                                                                                                                                                                                                                                       |
|----|----------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Leakage Current (μA)                         |                                                                           | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                                                                                                                                 | JIS C 5101-1, 4.9<br>Applied voltage : Rated voltage                      Duration : 5 min<br>Measuring temperature : Room temperature                                                                                                                                                                                                            |
| 2  | Capacitance (μF)                             |                                                                           | Shall be within the specified tolerance.                                                                                                                                                                                         | JIS C 5101-1, 4.7<br>Measuring frequency : 120 Hz ±20%<br>Measuring voltage : 0.5 Vrms +1.5 to 2 VDC<br>*Spec. Number 520 : 0.5 Vrms +1.1 to 1.5 VDC<br>Measuring temperature : Room temperature                                                                                                                                                  |
| 3  | Dissipation Factor                           |                                                                           | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                                                                                                                                 | JIS C 5101-1, 4.8<br>Measuring frequency : 120 Hz ±20%<br>Measuring voltage : 0.5 Vrms +1.5 to 2 VDC<br>*Spec. Number 520 : 0.5 Vrms +1.1 to 1.5 VDC<br>Measuring temperature : Room temperature                                                                                                                                                  |
| 4  | ESR(Equivalent series resistance)            |                                                                           | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                                                                                                                                 | JIS C 5101-1, 4.8<br>Measuring frequency : 100kHz ±10%<br>Measuring voltage : 0.5Vrms or less<br>Measuring temperature : Room temperature                                                                                                                                                                                                         |
| 5  | Characteristics at High and Low Temperature  |                                                                           |                                                                                                                                                                                                                                  | JIS C 5101-1, 4.29                                                                                                                                                                                                                                                                                                                                |
|    | Step1                                        | Leakage Current<br>Capacitance Change<br>Dissipation Factor               | Shall not exceed the value in No.1.<br>Shall be within the specified tolerance.<br>Shall not exceed the value in No.3.                                                                                                           | Measuring temperature : 20 ±2°C                                                                                                                                                                                                                                                                                                                   |
|    | Step2                                        | Capacitance Change<br>Dissipation Factor                                  | Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                                                                                         | Measuring temperature : -55 ±3°C                                                                                                                                                                                                                                                                                                                  |
|    | Step3                                        | Leakage Current<br>Capacitance Change<br>Dissipation Factor               | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shall be within ± 2% of the value at Step 1.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                             | Measuring temperature : 20 ±2°C                                                                                                                                                                                                                                                                                                                   |
|    | Step4                                        | Leakage Current<br>Capacitance Change<br>Dissipation Factor               | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                     | Measuring temperature : 85 ±2°C<br>*Spec. Number 520 : 65 ±2°C                                                                                                                                                                                                                                                                                    |
|    | Step5                                        | Leakage Current<br>Capacitance Change<br>Dissipation Factor               | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                     | Measuring temperature : 125 ±2°C<br>Measuring voltage : Derated voltage at 125°C                                                                                                                                                                                                                                                                  |
|    | Step6                                        | Leakage Current<br>Capacitance Change<br>Dissipation Factor               | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                     | Measuring temperature : 20 ±2°C                                                                                                                                                                                                                                                                                                                   |
| 6  | Surge                                        | Leakage Current<br>Capacitance Change<br>Dissipation Factor<br>Appearance | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>There shall be no evidence of mechanical damage. | IS C 5101-1, 4.26<br>Test temperature and applied voltage :<br>To each half of specimens<br>• 85 ±2°C, rated voltage × 1.15<br>• 125 ±2°C, 2/3 × rated voltage × 1.15<br>*Spec. Number 520<br>• 65 ±2°C, rated voltage × 1.15<br>• 125 ±2°C, 1/2 × rated voltage × 1.15<br>Series protective resistance : 1000 Ω<br>Discharge resistance : 1000 Ω |
| 7  | Shear Test                                   |                                                                           | There shall be no evidence of mechanical damage.                                                                                                                                                                                 | JIS C 5101-1, 4.34<br>Capacitors mounted under the following conditions are used as specimens.<br>• Indirect heating method (reflow)<br>• Temperature : 240 ±10°C / Time : Less than 10 sec<br>Pressure : Case U : 1N<br>Case M, S, A : 5N<br>Duration : 10 ±1 sec                                                                                |
| 8  | Substrate Bending<br>Test(Terminal Strength) | Capacitance<br>Appearance                                                 | Initial value to remain steady during measurement.<br>There shall be no evidence of mechanical damage.                                                                                                                           | JIS C 5101-1, 4.35<br>Bending : 1 mm                                                                                                                                                                                                                                                                                                              |
| 9  | Vibration<br>(Vibration Resistance)          | Capacitance<br>Appearance                                                 | Initial value to remain steady during measurement.<br>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<br>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> Duration : 11 ms<br>Wave form : Half-sine                                                                                                                                                                                                                                          |
| 11 | Solderability                                |                                                                           | Solder shall completely cover the terminal surface (there shall be no pin holes,Non-wetting or solder repelling).                                                                                                                | JIS C 5101-1, 4.15<br>Solder temperature : 235 ±5°C                      Dipping time : 2 ±0.5 sec<br>Dipping depth : Terminal shall be dipped into melted solder.                                                                                                                                                                                |
| 12 | Resistance to<br>Soldering Heat              | Leakage Current<br>Capacitance Change<br>Dissipation Factor<br>Appearance | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>There shall be no evidence of mechanical damage. | IR reflow method<br>Preheating : 130 to 160°C for about 60 sec<br>Reflow : 200°C, less than 60 sec, 260°C max.<br>Number of cycles : 2                                                                                                                                                                                                            |
| 13 | Component solvent<br>resistance              | Leakage Current<br>Capacitance Change<br>Dissipation Factor               | Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Within ±15% of initial value<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.                                                             | JIS C 5101-1, 4.31<br>Temperature : 23 ±5°C                      Dipping time : 5 ±0.5 min.<br>Conditioning : JIS C 0052 method 2                      Solvent : Isopropyl alcohol                                                                                                                                                                |
| 14 | Solvent resistance of<br>marking             | Appearance                                                                | After the test the marking shall be legible.                                                                                                                                                                                     | JIS C 5101-1, 4.32<br>Temperature : 23 ±5°C                      Dipping time : 5 ±0.5 min.<br>Conditioning : JIS C 0052 method 1                      Solvent : Isopropyl alcohol<br>Rubbing material : cotton wool                                                                                                                              |

| No | Item                        | Performanc                                                                                                                                                                                                                                                                                                                                      | Test method                                                                                                                                                                                                                                                                       |
|----|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15 | Rapid change of temperature | Leakage Current<br>Capacitance Change<br>Dissipation Factor<br>Appearance<br><br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>There shall be no evidence of mechanical damage.                               | JIS C 5101-1, 4.16<br>Number of cycles : 5<br>Step 1 : -55 ±3°C, 30 ±3 min.    Step 2 : 25 +10/-5°C, 3 min. max.<br>Step 3 : +125 ±2°C, 30 ±3 min.    Step 4 : 25 +10/-5°C, 3 min. max.                                                                                           |
| 16 | Damp heat , steady state    | Leakage Current<br>Capacitance Change<br>Dissipation Factor<br>Appearance<br><br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>There shall be no evidence of mechanical damage.                               | JIS C 5101-1, 4.22<br>Temperature : 40 ±2°C<br>Moisture : 90 to 95% R.H.<br>Duration : 500 +24/-0h                                                                                                                                                                                |
| 17 | Endurance                   | Leakage Current<br>Capacitance Change<br>Dissipation Factor<br>Appearance<br><br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>Shown in CATALOG NUMBERS AND RATING.<br>Shall not exceed the values shown in CATALOG NUMBERS AND RATING.<br>There shall be no evidence of mechanical damage, and marking shall be legible. | JIS C 5101-1, 4.23<br>Test temperature and applied voltage<br>:85 ±2°C and rated voltage or 125 ±3°C and 2/3×rated voltage<br>*Spec. Number 520<br>:65 ±2°C and rated voltage or 125 ±3°C and 1/2×rated voltage<br>Duration : 2000 +72/-0h<br>Power supply impedance : 3Ω or less |

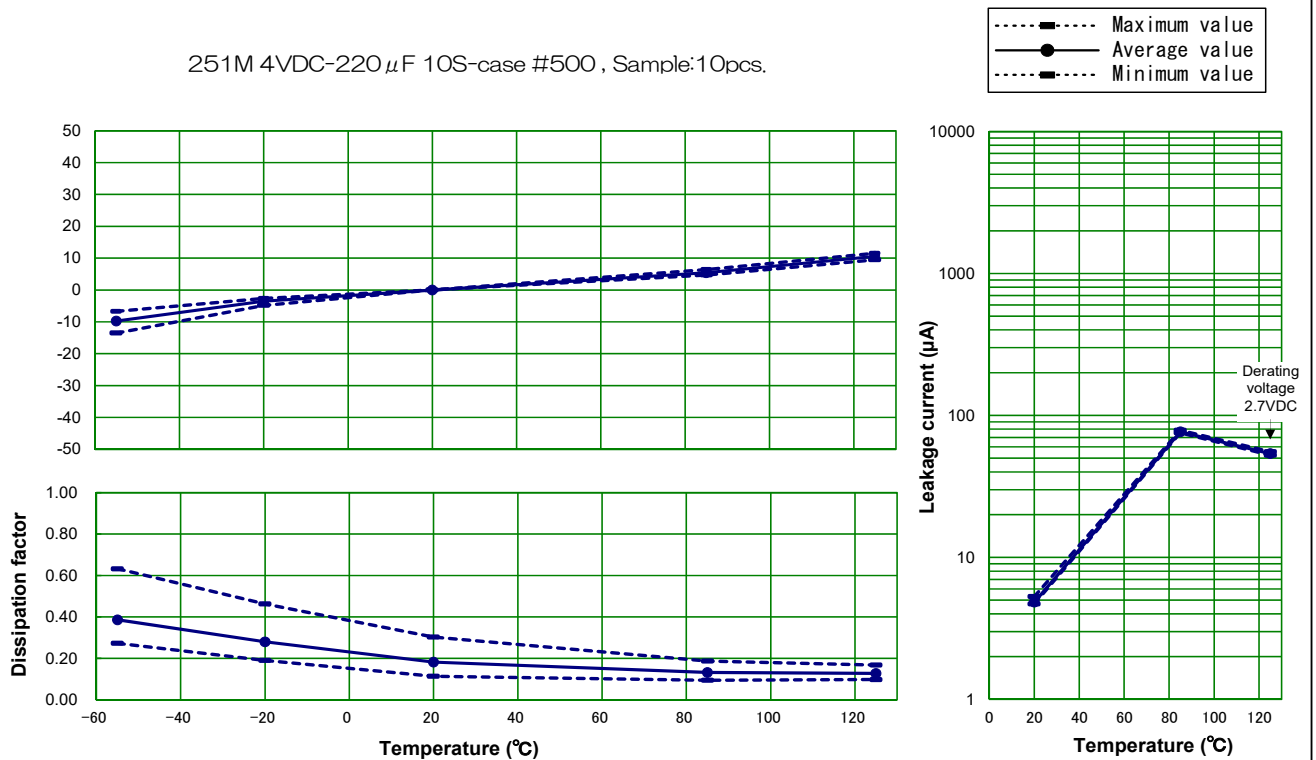
## FREQUENCY CHARACTERISTICS

251M 4VDC-220  $\mu$ F 10S-case #500, Sample:1pcs.



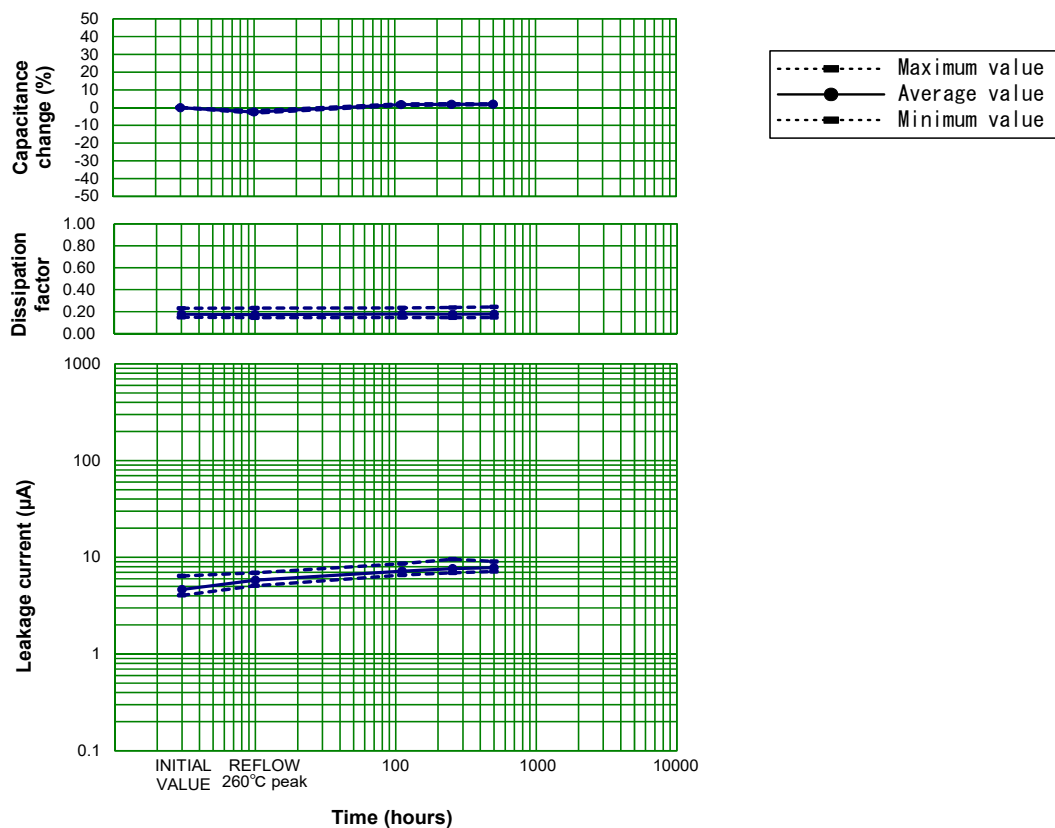
## TEMPERATURE CHARACTERISTICS

251M 4VDC-220  $\mu$ F 10S-case #500, Sample:10pcs.



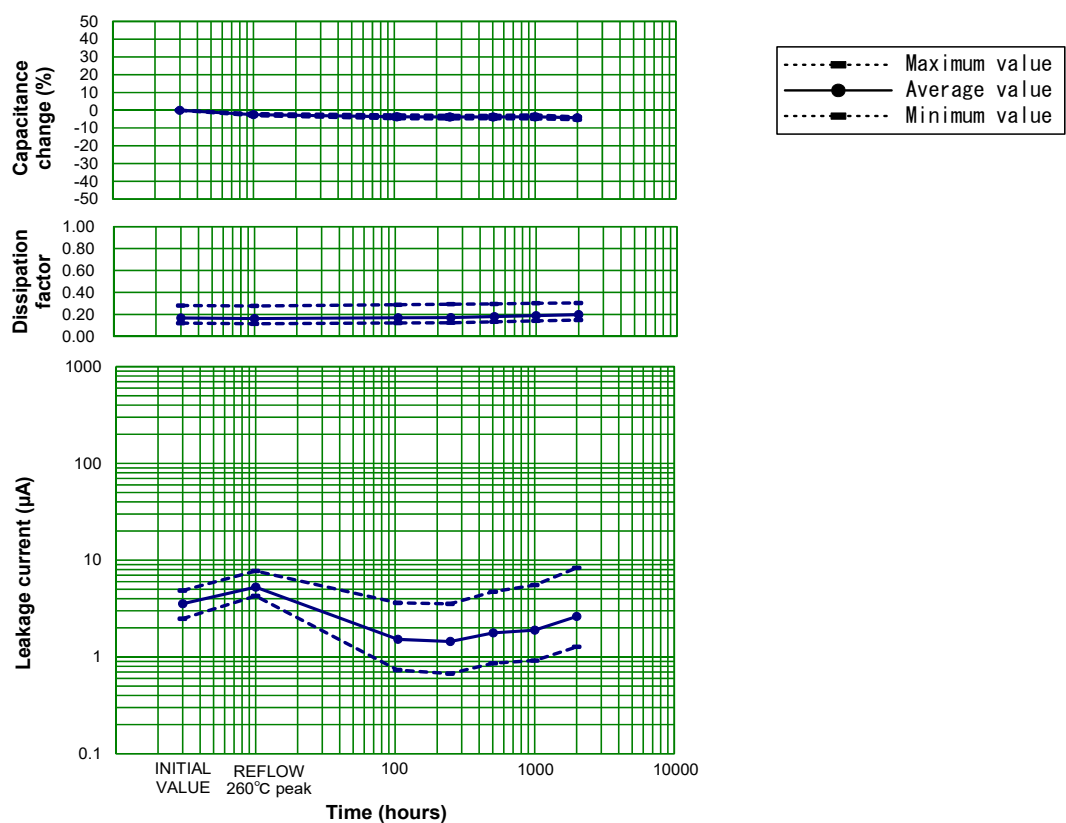
## DAMP HEAT, STEADY STATE 40°C,95%RH

251M 4VDC-220  $\mu$ F 10S-case #500 , Sample:50pcs.



## ENDURANCE 85°C,RATED VOLTAGE

251M 4VDC-220  $\mu$ F 10S-case #500 , Sample:50pcs.





## Application Notes for Tantalum Solid Electrolytic Capacitor

### 1. Operating Voltage

Tantalum Solid Electrolytic Capacitor shall be operated at the rated voltage or lower.

Rated voltage: The "rated voltage" refers to the maximum DC voltage that is allowed to be continuously applied between the capacitor terminals at the rated temperature.

Surge voltage: The "surge voltage" refers to the voltage that is allowed to be instantaneously applied to the capacitor at the rated temperature or the maximum working temperature. The capacitor shall withstand the voltage when a 30-second cycle of application of the voltage through a 1000  $\Omega$  series resistance is repeated 1000 times in 6-minute periods.

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.
- (3) Ripple current should not exceed the allowable values.

### 3. Reverse Voltage

Tantalum solid electrolytic capacitor is polarity. Please do not impress reverse voltage. As well, please confirm the potential of the tester beforehand when both ends of the capacitor are checked with the tester etc.

### 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 (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.

$$P = I^2 \times ESR \text{ or } P = \frac{E^2 \times ESR}{Z^2} \quad \text{Permissible ripple current } I_{max} = \sqrt{\frac{P_{max}}{ESR}} \quad (\text{Arms})$$

$$\text{Permissible ripple voltage } E_{max} = \sqrt{\frac{P_{max}}{ESR}} \times Z$$

$$= I_{max} \times Z \quad (\text{Vrms})$$

$I_{max}$  : 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

| Case Code                              | Pmax (W) |
|----------------------------------------|----------|
| 06U                                    | 0.034    |
| 06U (Specification Number 500)         | 0.034    |
| 09M                                    | 0.057    |
| 09M,10M (Specification Number 500/520) | 0.057    |
| 10S,12S,13S                            | 0.063    |
| 09S,10S (Specification Number 500)     | 0.066    |
| 10A,12A,13A                            | 0.077    |

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 different from above list of P max value.

Table 2 Pmax multiplier at each operating temperature

| Operating temperature ( $^{\circ}\text{C}$ ) | Multiplier |
|----------------------------------------------|------------|
| 25                                           | 1.0        |
| 55                                           | 0.9        |
| 85                                           | 0.8        |
| 125                                          | 0.4        |

### 5. Application on low-impedance circuit

The failure rate of low impedance circuit at 0.1  $\Omega/\text{V}$  is about five times greater than that of a 1  $\Omega/\text{V}$  circuit. To curtail this higher failure rate, tantalum capacitors used in low impedance circuits, such as filters for power supplies, particularly switching power supplies, or for noise by-passing, require that operating voltage be derated to less than half of the rated voltage. Actually, less than 1/3 of the rated voltage is recommended.

### 6. Non Polar Application(BACK TO BACK)

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

### 7. Soldering

#### 7.1. Preheating

To obtain optimal reliability and solderability conditions, capacitors should be pre-heated at 130 to 200  $^{\circ}\text{C}$  for approximately 60 to 120 seconds.

#### 7.2. Soldering

The body of the capacitor shall not exceed 260  $^{\circ}\text{C}$  during soldering.

(1) Reflow Soldering

Reflow soldering is a process in which the capacitors are mounted on a printed board with solder paste. There are two methods of Reflow Soldering: Direct and Atmospheric Heat.

· Direct Heat (Hot plate)

During the Direct Heat method, the capacitor has been positioned on a printed board, which is then placed upon a hot plate.

The capacitor maintains a lower temperature than the substrate, which in turn stays at a lower temperature than the hot plate.

· Atmospheric Heat

a) VPS (Vapor Phase Soldering)

During VPS, the substrate is heated by an inert liquid with a high boiling point. The temperature of the capacitor's body and the temperature of the substrate are about the same as the atmosphere. This temperature should be below 240 $^{\circ}\text{C}$ .

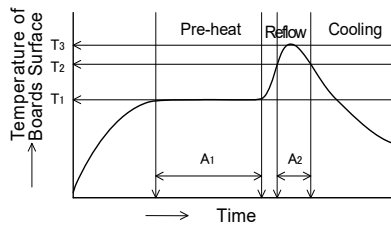
b) Near and Far IR Ray

Due to the heat absorption of the capacitor's body, the internal temperature of the capacitors may be 20 ~ 30 $^{\circ}\text{C}$  higher than the setting temperature and may exceed 260 $^{\circ}\text{C}$ .

Temperature control is crucial in maintaining a temperature of 260  $^{\circ}\text{C}$  or lower.

### c) Convection Oven

An infrared ray is the main source of heat in this process. The temperature of the substrate and the capacitors can be maintained at a similar level by the circulation of heated air, or an inert gas.



| Temperature    | Time                   |
|----------------|------------------------|
| T1=130°C~200°C | A1=60~120sec.          |
| T2=220°C~230°C | A2<60秒以下               |
| T3=~260°C      | 10sec. or less than 10 |

Number of times: 2 times max.

### (2) Soldering with a 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 5 seconds.

### (3) Please consult us for other methods.

## 8. 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. Protective Resin Coating

After components are assembled to substrate, a protective resin coating is sometimes applied. As this resin coating cures, it gives mechanical and thermal stress to Tantalum capacitors. This stress can cause damage to the capacitors, which affects their reliability.

Before using a resin coating, proper research must be done in regards to the material and process to insure that excessive stress will not be applied to capacitors and other components.

## 10. Vibration

Approximately 300 G shall be applied to a capacitor, when dropped from 1 meter to a concrete floor.

Although capacitors are made to withstand this drop test, stress from shock due to falling or striking does cause damage to the capacitors and increases failure rates. Do not subject capacitors to this type of mechanical stress.

## 11. Ultrasonic cleaning

Matsuo does not recommend Ultrasonic cleaning. This may cause damage to the capacitors, and may even cause broken terminals. If the Ultrasonic cleaning process will be used, please note the following:

- (1) The solvent should not be boiled. (Lower the ultrasonic wave output or use solvent with The high boiling point.)
- (2) The recommended wattage is less than 0.5 watts per cm<sup>2</sup>.
- (3) The cleaning time should be kept to a minimum. Also, samples must be swang in the solvent. Please consult us.

## 12. Additional Notes

- When more than one capacitor is connected in series, a resistor that can distribute the voltage equally to the capacitors shall be connected in parallel.
- The capacitor cases shall not be cut even if the mounting space is insufficient.
- During a customers aging process, voltage should remain under the rated voltage at all times.
- Capacitors should never be touched or manipulated while operating.
- Capacitors are not meant to be dismantled.
- When testing capacitors, please examine the power source before conducting test to insure the tester's polarity and applied voltage.
- In the event of a capacitor burning, smoking, or emitting an offensive smell during operation, please turn the circuit "off" and keep hands and face away from the burning capacitor.
- If a capacitor be electrical shorted, it becomes hot, and the capacitor element may ignite. In this case, the printed board may be burnt out.
- Capacitors should be stored at room temperature under low humidity. Capacitors should never be stored under direct sunlight, and should be stored in an environment containing dust.
- If the capacitors will be operated in a humid environment, they should be sealed with a compound under proper conditions.
- Capacitors should not be stored or operated in environments containing acids, alkalis or active gasses.
- When capacitors are disposed of as "scrap" or waste, they should be treated as Industria Waste since they contain various metals and polymers.
- Capacitors submitted as samples should not be used for production purposes.
- 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.

These application notes are prepared based on "Guideline of notabilia for fixed tantalum electrolytic capacitors with solid electrolyte for use in electronic equipment" (RCR-2368) issued by Japan Electronics and Information Technology Industries Association (JEITA).

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.

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.7 (2025.10.03)

| 市場      | 適用用途分類 | 用途                                                                                                                                          |                                                                                                                                                    | 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                                     | 回路保護素子                                                                     |
| 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                                        | 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                           | 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 |
|         | 3-A    | ・車載用だが一般電装機器で車室内環境において使用される機器                                                                                                               | ・エアコン、カーナビ等の車室内搭載部品、車載用通信機器                                                                                                                        |                                                  | KAB型Mシリーズ                                                                  |
|         | 3-B    | ・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                                                                              | ・家庭用/ビル用等のセキュリティ管理システム<br>・工業用ロボットや工作機械等の制御機器                                                                                                      | 267型MEシリーズ<br>279型<br>281型MEシリーズ<br>TCA型<br>TCD型 | JHC型                                                                       |
| 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>267型Cシリーズ<br>TCB型                   | JAE型、JAG型<br>JAJ型、JAK型<br>KAB型<br>KAB型Tシリーズ<br>KVA型                        |

| Market                             | Application classification by use | Use                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                | Recommendation Type                                                            | Recommendation Type                                                                                                        |
|------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
|                                    |                                   | Outline                                                                                                                                                                                                                                                                                                                                 | Typical example of application                                                                                                                                                                                                                                 | Chip Tantalum Capacitors                                                       | Circuit Protection Components                                                                                              |
| 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                                                              | With no relevance                                                                                                          |
| In-vehicle<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                                         | 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 |
|                                    | 3-A                               | - General electrical equipment designed for use in vehicles but used in the interior environment                                                                                                                                                                                                                                        | - Vehicle indoor loading parts, such as an air-conditioner and car navigation, and in-vehicle communication facility                                                                                                                                           |                                                                                | Type KAB M series                                                                                                          |
|                                    | 3-B                               | -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                                                                                                               | <ul style="list-style-type: none"> <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.E Sereis<br>Type 279<br>Type 281 M.E Sereis<br>Type TCA<br>Type TCD | Type JHC                                                                                                                   |
| 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 251 M Series<br>Type 267 C Series<br>Type TCB                             | Type JAE, Type JAG<br>Type JAJ, Type JAK<br>Type KAB<br>Type KAB T series<br>Type KVA                                      |

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 |

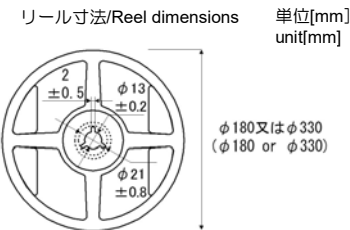
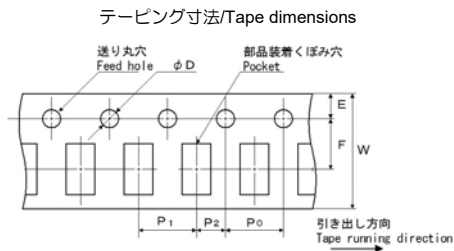
定格：267型Nシリーズ, TCA型  
Type：267 N Series, TCA

| 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                |                        |                        |                                    | 500                               | 8,000 |  |  |  |  |  |  |  |  |
| C                  | 6.0×3.2             | 12.0±0.3  | 5.5±0.05  | 1.5±0.1   |                        |                        |                        |                                    |                                   | 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            |           |           | 1.75±0.1  |                        |                        |                        |                        | 8.0±0.1                           | φ 1.5 <sup>+0.1</sup> <sub>0</sub> |
| 52                 | 3.2×1.6             |           |           |           | φ 1.5±0.1              |                        |                        | 2,000                  |                                   |                                    |
| 44E                | 7.3×5.8             | 12±0.3    | 5.5±005   |           | 500                    |                        |                        | 1,500                  |                                   |                                    |
| 59F                | 11.0×7.3            | 24±0.3    | 11.5±005  |           | -                      |                        |                        | 500                    |                                   |                                    |



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

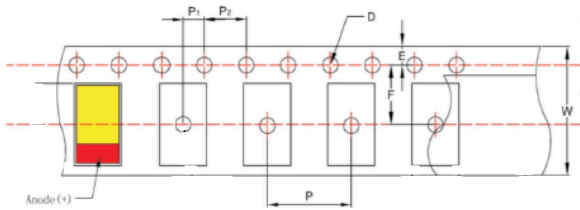
| φ 180リール<br>φ 180Reel | φ 330リール<br>φ 330Reel | 極性<br>Anode notation  |
|-----------------------|-----------------------|-----------------------|
| L                     | P                     | 送り穴側 +<br>Feed hole + |
| R                     | N                     | 送り穴側 -<br>Feed hole - |

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

定格：TCD型  
Type：TCD

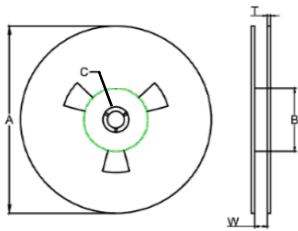
| ケース記号<br>Case Code | ケースサイズ<br>Case size | W<br>(mm) | F<br>(mm) | E<br>(mm) | P<br>(mm) | P <sub>1</sub><br>(mm) | P <sub>2</sub><br>(mm) | φ D<br>(mm) | 包装数/リール(個)<br>Quantity/Reel (pcs) |
|--------------------|---------------------|-----------|-----------|-----------|-----------|------------------------|------------------------|-------------|-----------------------------------|
|                    |                     |           |           |           |           |                        |                        |             | φ 180                             |
| D                  | 7.3×4.3×2.8         | 12±0.30   | 5.5±0.05  | 1.75±0.10 | 4±0.10    | 8±0.10                 | 2±0.10                 | 1.55±0.20   | 500                               |

テーピング寸法/Tape dimensions



単位[mm]  
unit[mm]

リール寸法/Reel dimensions



| リール<br>Reel | テープ幅<br>Tape width | A        | B      | C         | W           | T         |
|-------------|--------------------|----------|--------|-----------|-------------|-----------|
| φ 180       | 12                 | 178±2.00 | 50 min | 13.0±0.50 | 12.4+1.5/-0 | 1.50±0.50 |