

# Chip tantalum capacitors (Bottom surface electrode type : Large capacitance)

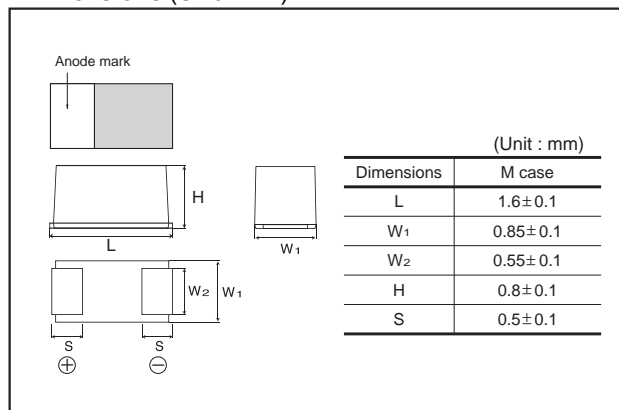
## TC Series M Case

### ●Features (M)

With an original bottom surface electrode structure.

- 1) Excellent adhesion.
- 2) Easy visual recognition of fillets.
- 3) Large capacitance, low ESR.

### ●Dimensions (Unit : mm)



### ●Part No. Explanation



① Series name  
TC

② Case style  
M

③ Rated voltage

|                   |     |    |     |    |    |
|-------------------|-----|----|-----|----|----|
| Rated voltage (V) | 2.5 | 4  | 6.3 | 10 | 16 |
| CODE              | 0E  | 0G | 0J  | 1A | 1C |

④ Nominal capacitance

Nominal capacitance in pF in 3 digits:  
2 significant figures followed by the figure  
representing the number of 0's.

⑤ Capacitance tolerance

M : ±20%

⑥ Taping

8 : Tape width  
R : Positive electrode on the side opposite to sprocket hole

● **Rated table**

| (μF)      | Rated voltage (V) |         |           |          |          |          |          |
|-----------|-------------------|---------|-----------|----------|----------|----------|----------|
|           | 2.5<br>0E         | 4<br>0G | 6.3<br>0J | 10<br>1A | 16<br>1C | 20<br>1D | 25<br>1E |
| 1.0 (105) |                   |         |           | M        | M        |          | M*       |
| 1.5 (155) |                   |         |           |          |          |          |          |
| 2.2 (225) |                   |         |           | M        | M        | M*       |          |
| 3.3 (335) |                   |         |           |          |          |          |          |
| 4.7 (475) |                   |         | M         | M        | M*       |          |          |
| 6.8 (685) |                   |         |           |          |          |          |          |
| 10 (106)  |                   | M       | M         | M        |          |          |          |
| 15 (156)  |                   |         |           |          |          |          |          |
| 22 (226)  |                   | M       | M         |          |          |          |          |
| 33 (336)  |                   | M       | M         |          |          |          |          |
| 47 (476)  | M                 |         |           |          |          |          |          |

Remark) Case size codes (M) in the above show products line-up.

\* Under development

● **Marking**

The indications listed below should be given on the surface of a capacitor.

- (1) Polarity : The polarity should be shown by □ bar. (on the anode side)
- (2) Rated DC voltage : Due to the small size of M case, a voltage code is used as shown below.
- (3) Visual typical example (1) voltage code (2) capacitance code

| Voltage Code | Rated DC Voltage (V) |
|--------------|----------------------|
| e            | 2.5                  |
| g            | 4                    |
| j            | 6.3                  |
| A            | 10                   |
| C            | 16                   |
| D            | 20                   |
| E            | 25                   |

| Capacitance Code | Nominal Capacitance (μF) |
|------------------|--------------------------|
| A                | 1.0                      |
| E                | 1.5                      |
| J                | 2.2                      |
| N                | 3.3                      |
| S                | 4.7                      |
| W                | 6.8                      |
| a                | 10                       |
| e                | 15                       |
| j                | 22                       |
| n                | 33                       |
| s                | 47                       |

[M case] note 1)  $\frac{A}{(1)} \frac{s}{(2)}$

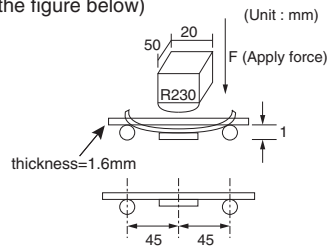


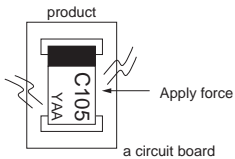
note 2) voltage code and capacitance code are variable with parts number

● Characteristics

| Item   |   | Performance   | Test conditions (based on JIS C 5101-1 and JIS C 5101-3)  |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|--|---|---|---|--------------|-------|------|---|---------|----------|---|------------|--------------|---|---------|----------|---|------------|--------------|
| Operating Temperature                                  |   | -55°C to +125°C   | Voltage reduction when temperature exceeds +85°C  |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Maximum operating temperature with no voltage derating |   | +85°C   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Rated voltage (VDC)                                    |   | 2.5 4 6.3 10 16 20 25   | at 85°C   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Category voltage (VDC)                                 |   | 1.6 2.5 4 6.3 10 13 16  | at 125°C  |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Surge voltage (VDC)                                    |   | 3.2 5.2 8 13 20 26 32   | at 85°C   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| DC Leakage current                                     |   | Shall be satisfied the voltage on " Standard list "                                 | As per 4.9 JIS C 5101-1<br>As per 4.5.1 JIS C 5101-3<br>Voltage : Rated voltage for 5min  |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Capacitance tolerance                                  |   | Shall be satisfied allowance range. ±20%  | As per 4.7 JIS C 5101-1<br>As per 4.5.2 JIS C 5101-3<br>Measuring frequency : 120±12Hz<br>Measuring voltage : 0.5Vrms +1.5.DC<br>Measuring circuit : DC Equivalent series circuit   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Tangent of loss angle (Df, tan δ)                      |   | Shall be satisfied the voltage on " Standard list "                                 | As per 4.8 JIS C 5101-1<br>As per 4.5.3 JIS C 5101-3<br>Measuring frequency : 120±12Hz<br>Measuring voltage : 0.5Vrms +1.5.DC<br>Measuring circuit : DC Equivalent series circuit   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Impedance  |   | Shall be satisfied the voltage on " Standard list "                                 | As per 4.10 JIS C 5101-1<br>As per 4.5.4 JIS C 5101-3<br>Measuring frequency : 100±10kHz<br>Measuring voltage : 0.5Vrms or less<br>Measuring circuit : DC Equivalent series circuit   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Resistance to Soldering heat                           | Appearance  | There should be no significant abnormality. The indications should be clear.        | As per 4.14 JIS C 5101-1<br>As per 4.6 JIS C 5101-3<br>Dip in the solder bath<br>Solder temp : 260±5°C<br>Duration : 5±0.5s<br>Repetition : 1<br>After the specimens, leave it at room temperature for over 24h and then measure the sample.  |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | L.C.  | Less than 200% of initial limit   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | ΔC / C  | TCM0J336□ : Within ±30% of initial value.<br>Others : Within ±20% of initial value. |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | Df (tan δ)  | Less than 200% of initial limit   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Temperature cycle                                      | Appearance  | There should be no significant abnormality. The indications should be clear.        | As per 4.16 JIS C 5101-1<br>As per 4.10 JIS C 5101-3<br>Repetition : 5 cycles<br>(1 cycle : steps 1 to 4) without discontinuation.<br><table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>Temp.</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55±3°C</td> <td>30±3min.</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>3min.or less</td> </tr> <tr> <td>3</td> <td>125±2°C</td> <td>30±3min.</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>3min.or less</td> </tr> </tbody> </table><br>After the specimens, leave it at room temperature for over 24h and then measure the sample. |              | Temp. | Time | 1 | -55±3°C | 30±3min. | 2 | Room temp. | 3min.or less | 3 | 125±2°C | 30±3min. | 4 | Room temp. | 3min.or less |
|  |   | Temp.   |   | Time         |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | 1   | -55±3°C   |   | 30±3min.     |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | 2   | Room temp.  |   | 3min.or less |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| 3  | 125±2°C   | 30±3min.  |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| 4  | Room temp.  | 3min.or less  |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| L.C.   | Less than 200% of initial limit   |   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| ΔC / C   | TCM0J336□ : Within ±30% of initial value.<br>Others : Within ±20% of initial value. |   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Df (tan δ)   | Less than 200% of initial limit   |   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
| Moisture resistance                                    | Appearance  | There should be no significant abnormality. The indications should be clear.        | As per 4.22 JIS C 5101-1<br>As per 4.12 JIS C 5101-3<br>After leaving the sample under such atmospheric condition that the temperature and humidity are 60±2°C and 90 to 95% RH, respectively, for 500±12h leave it at room temperature for over 24h and then measure the sample.   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | L.C.  | Less than 200% of initial limit   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | ΔC / C  | TCM0J336□ : Within ±30% of initial value.<br>Others : Within ±20% of initial value. |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |
|  | Df (tan δ)  | Less than 200% of initial limit   |   |              |       |      |   |         |          |   |            |              |   |         |          |   |            |              |

| Item                        |             | Performance  | Test conditions (based on JIS C 5101-1 and JIS C 5101-3)   |
|-----------------------------|-------------|--|--|
| Temperature Stability       | Temp.       | -55°C  | As per 4.29 JIS C 5101-1<br>As per 4.13 JIS C 5101-3   |
|                             | ΔC / C      | TCM0G336□ : Within 0/-30% of initial value<br>TCM0J226□ : Within 0/-30% of initial value<br>TCM0J336□ : Within 0/-30% of initial value<br>Others : Within 0/-15% of initial value    |  |
|                             | Df (tan δ)  | Shall be satisfied the voltage on " Standard list "  |  |
|                             | L.C.        | -  |  |
|                             | Temp.       | +85°C  |  |
|                             | ΔC / C      | TCM0G336□ : Within +15/-5% of initial value<br>TCM0J226□ : Within ±15/-5% of initial value<br>TCM0J336□ : Within ±15/-5% of initial value<br>Others : Within +15/0% of initial value |  |
|                             | Df (tan δ)  | Shall be satisfied the voltage on " Standard list "  |  |
|                             | L.C.        | Less than 1000% of initial value   |  |
|                             | Temp.       | +125°C   |  |
|                             | ΔC / C      | TCM0G336□ : Within +20/-5% of initial value<br>Others : Within +20/0% of initial value   |  |
| Surge voltage               | Appearance  | There should be no significant abnormality.  | As per 4.26JIS C 5101-1<br>As per 4.14JIS C 5101-3<br>Apply the specified surge voltage every 5±0.5 min. for 30±5 s. each time in the atmospheric condition of 85±2°C. Repeat this procedure 1,000 times.<br>After the specimens, leave it at room temperature for over 24h and then measure the sample. |
|                             | L.C.        | Less than 200% of initial limit  |  |
|                             | ΔC / C      | Within ±20% of initial value   |  |
|                             | Df (tan δ)  | Less than 200% of initial limit  |  |
| Loading at High temperature | Appearance  | There should be no significant abnormality.  | As per 4.23 JIS C 5101-1<br>As per 4.15 JIS C 5101-3<br>After applying the rated voltage for 1000+36/0 h without discontinuation via the serial resistance of 3Ω or less at a temperature of 85±2°C, leave the sample at room temperature / humidity for over 24h and measure the value.                 |
|                             | L.C.        | Less than 200% of initial limit  |  |
|                             | ΔC / C      | TCM0G336□ : Within ±30% of initial value<br>TCM0J226□ : Within ±30% of initial value<br>TCM0J336□ : Within ±30% of initial value<br>Others : Within ±20% of initial value            |  |
|                             | Df (tan δ)  | Less than 200% of initial limit  |  |
| Terminal strength           | Capacitance | The measured value should be stable.   | As per 4.35 JIS C 5101-1<br>As per 4.9 JIS C 5101-3<br>A force is applied to the terminal until it bends to 1mm and by a prescribed tool maintain the condition for 5s.<br>(See the figure below)  |
|                             | Appearance  | There should be no significant abnormality.  |  |



| Item                   | Performance  | Test conditions (JIS C 5101-1 and JIS C 5101-3)   |
|------------------------|--|---|
| Adhesiveness           | The terminal should not come off.  | As per 4.34 JIS C 5101-1<br>As per 4.8 JIS C 5101-3<br>Apply force of 5N in the two directions shown in the figure below for 10±1s after mounting the terminal on a circuit board.<br>  |
| Dimensions             | Refer to "External dimensions"   | Measure using a caliper of JIS B 7507 Class 2 or higher grade.  |
| Resistance to solvents | The indication should be clear   | As per 4.32 JIS C 5101-1<br>As per 4.18 JIS C 5101-3<br>Dip in the isopropyl alcohol for 30±5s, at room temperature.  |
| Solderability          | 3/4 or more surface area of the solder coated terminal dipped in the soldering bath should be covered with the new solder. | As per 4.15.2 JIS C 5101-1<br>As per 4.7 JIS C 5101-3<br>Dip speed=25±2.5mm / s<br>Pre-treatment(accelerated aging): Leave the sample on the boiling distilled water for 1 h.<br>Solder temp. : 245±5°C<br>Duration : 3±0.5s<br>Solder : M705<br>Flux : Rosin 25% IPA 75% |
| Vibration              | Capacitance  | Measure value should not fluctuate during the measurement.  |
|                        | Appearance   | There should be no significant abnormality.   |
|                        |  | As per 4.17 JIS C 5101-1<br>Frequency : 10 to 55 to 10Hz/min.<br>Amplitude : 1.5mm<br>Time : 2h each in X and Y directions<br>Mounting : The terminal is soldered on a print circuit board.   |

● Standard products list, TC series M case

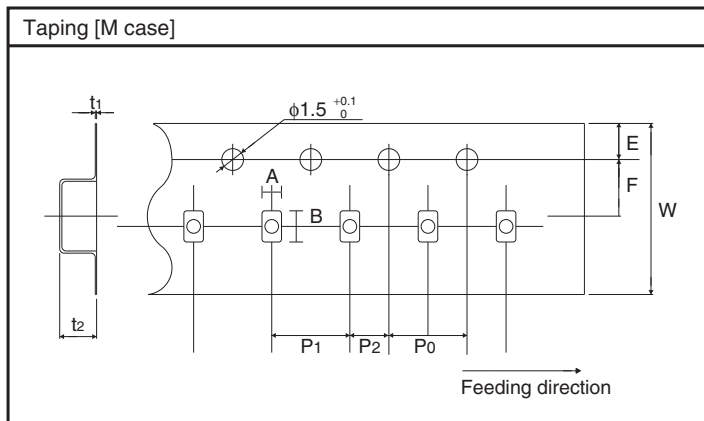
| Part No.     | Rated voltage<br>85°C<br>(V) | Category voltage<br>125°C<br>(V) | Surge voltage<br>85°C<br>(V) | Cap.<br>120Hz<br>(μF) | Tolerance<br>(%) | Leakage current<br>25°C<br>1WV.300s<br>(μA) | Df<br>120Hz<br>(%) |              |       | Impedance<br>100kHz<br>(Ω) |
|--------------|------------------------------|----------------------------------|------------------------------|-----------------------|------------------|---|--------------------|--------------|-------|----------------------------|
|              |                              |                                  |                              |                       |                  |   | -55°C              | 25°C<br>85°C | 125°C |                            |
| TC M 0E 476□ | 2.5                          | 1.6                              | 3.2                          | 4.7                   | ±20              | 0.5   | 30                 | 20           | 30    | 9.0                        |
| TC M 0G 106□ | 4                            | 2.5                              | 5.2                          | 10                    | ±20              | 0.5   | 30                 | 20           | 30    | 9.0                        |
| TC M 0G 226□ | 4                            | 2.5                              | 5.2                          | 22                    | ±20              | 0.9   | 30                 | 20           | 30    | 9.0                        |
| TC M 0G 336□ | 4                            | 2.5                              | 5.2                          | 33                    | +20              | 13.0  | 60                 | 30           | 40    | 9.0                        |
| TC M 0J 475□ | 6.3                          | 4                                | 8                            | 4.7                   | ±20              | 0.5   | 30                 | 20           | 30    | 9.0                        |
| TC M 0J 106□ | 6.3                          | 4                                | 8                            | 10                    | ±20              | 0.6   | 30                 | 20           | 30    | 9.0                        |
| TC M 0J 226□ | 6.3                          | 4                                | 8                            | 22                    | ±20              | 13.0  | 60                 | 30           | 40    | 9.0                        |
| TC M 0J 336□ | 6.3                          | 4                                | 8                            | 33                    | ±20              | 208   | 60                 | 30           | 40    | 9.0                        |
| TC M 1A 105□ | 10                           | 6.3                              | 13                           | 1.0                   | ±20              | 0.5   | 15                 | 10           | 15    | 15.0                       |
| TC M 1A 225□ | 10                           | 6.3                              | 13                           | 2.2                   | ±20              | 0.5   | 30                 | 20           | 30    | 13.5                       |
| TC M 1A 475□ | 10                           | 6.3                              | 13                           | 4.7                   | ±20              | 0.5   | 30                 | 20           | 30    | 9.0                        |
| TC M 1A 106□ | 10                           | 6.3                              | 13                           | 10                    | ±20              | 10.0  | 30                 | 20           | 30    | 9.0                        |
| TC M 1C 105□ | 16                           | 10                               | 20                           | 1.0                   | ±20              | 0.5   | 15                 | 10           | 15    | 15.0                       |
| TC M 1C 225□ | 16                           | 10                               | 20                           | 2.2                   | ±20              | 0.5   | 30                 | 20           | 30    | 13.5                       |

□=Tolerance (M : ±20%)

● Packaging specifications

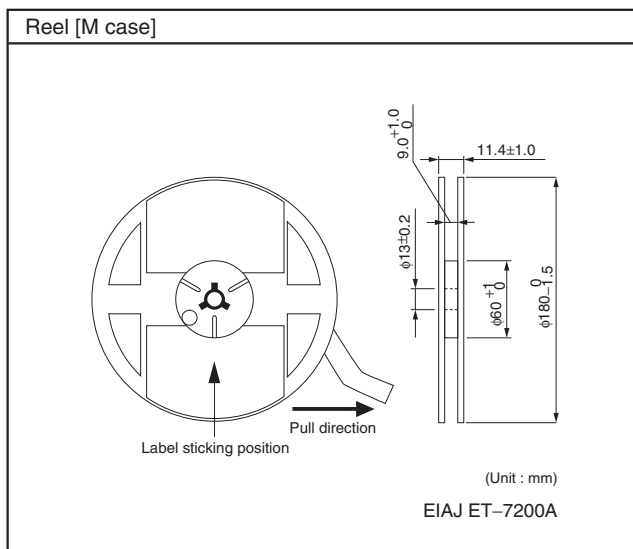
(Unit : mm)

| Case code | A±0.1 | B±0.1 | W±0.2 | E±0.1 | F±0.05 | P1±0.1 | P2±0.05 | P0±0.1 | t1±0.05 | t2±0.1 |
|-----------|-------|-------|-------|-------|--------|--------|---------|--------|---------|--------|
| M         | 1.0   | 1.8   | 8.0   | 1.75  | 3.5    | 4.0    | 2.0     | 4.0    | 0.20    | 1.0    |



● Packaging style

| Case code | Packaging | Packaging style |                    | Symbol | Basic ordering units |
|-----------|-----------|-----------------|--------------------|--------|----------------------|
| M case    | Taping    | plastic taping  | $\phi 180$ mm Reel | R      | 4,000pcs             |



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