

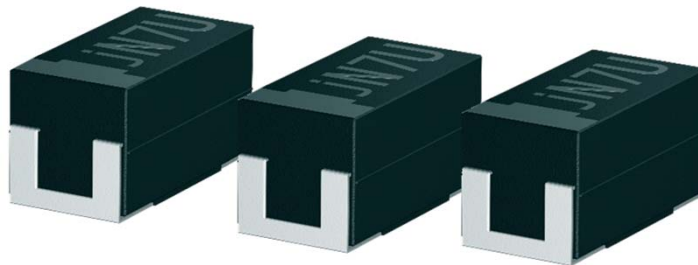
No. P-TCA-E018
DATE 2025-12

PRODUCTS DATA SHEET

Tantalum Solid Electrolytic Capacitors with Conductive Polymer

Type TCA

RoHS COMPLIANT
LEAD FREE



MATSUO ELECTRIC CO., LTD.

OUTLINE (Type TCA)

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

APPLICATION

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

FEATURES

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

APPLICATION CLASSIFICATION BY USE

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

RATINGS

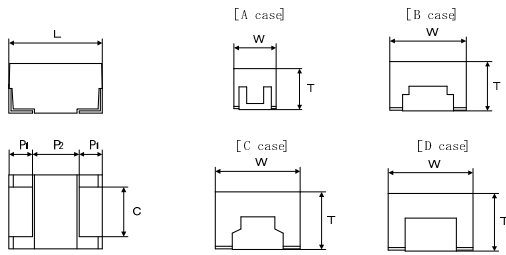
Item	Ratings
Failure Rate Level	1% / 1000 h
Category Temperature Range	-55 to +105°C (to be used at derated voltage when temperature exceeds 85°C)
Rated Voltage	2.5 - 4 - 6.3 - 10 VDC
Derated Voltage	2.0 - 3.2 - 5.0 - 8.0 VDC (105°C)
Capacitance	22~680 μF
Capacitance Tolerance	±20 % (M)

ORDERING INFORMATION

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

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

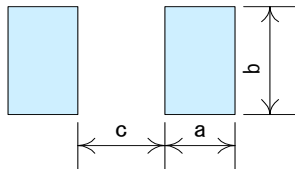
DIMENSIONS



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

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

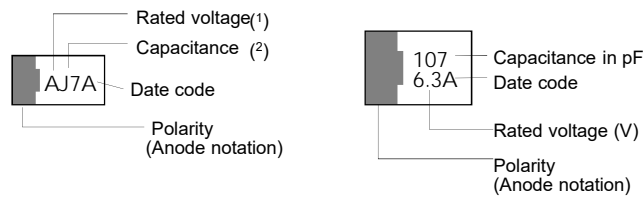
RECOMMENDED PAD DIMENSIONS



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

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

MARKING



Note ⁽¹⁾ Rated voltage is described as shown below. ⁽²⁾Capacitance is described as shown below.

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

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

STANDARD RATING

Dec., 2025

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

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

CATALOG NUMBERS AND RATING

Dec., 2025

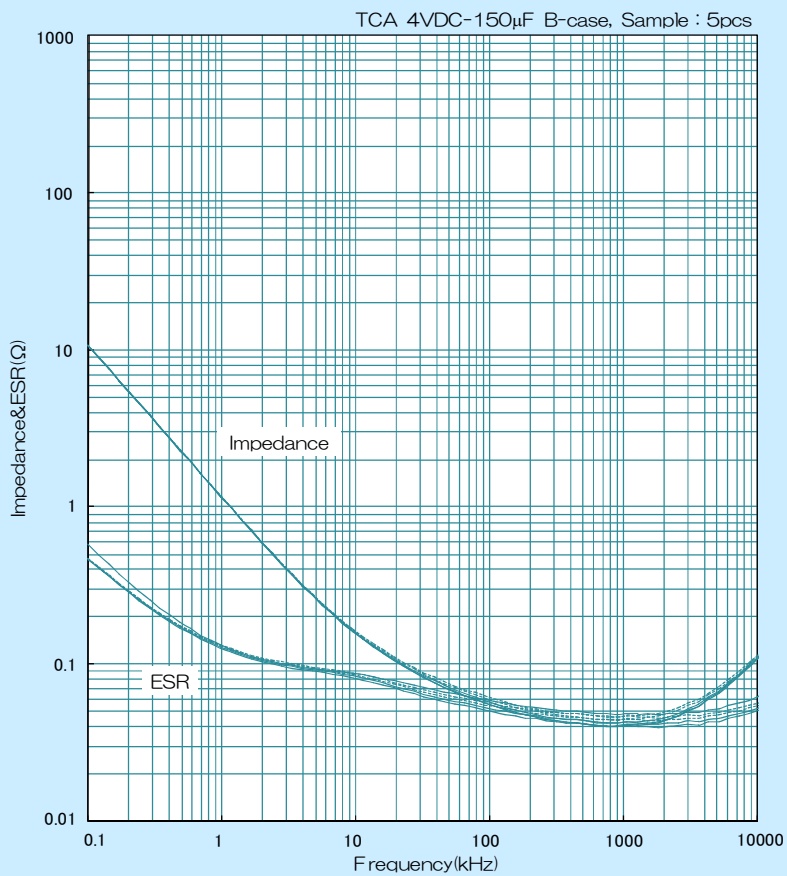
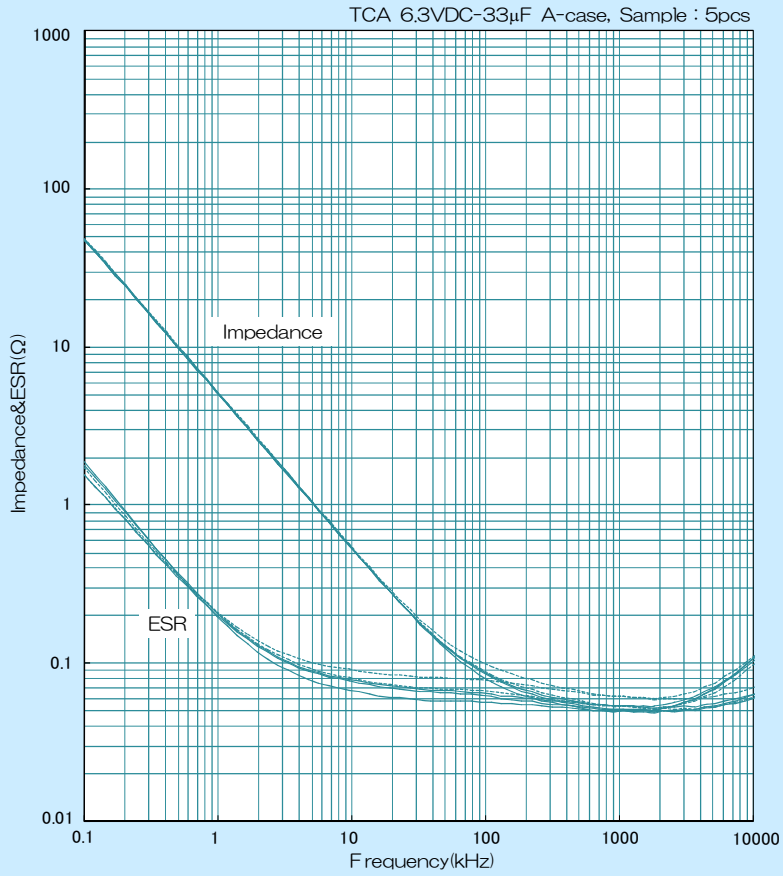
Catalog number ⁽¹⁾ (²)	Rated Voltage (VDC)	Capacitance (μF)	Tolerances (±%)	Case Code	Lct. (μA)			Max. Dissipation Factor			ESR (mΩ) 100 kHz	Max. permissible Ripple Current ⁽³⁾ (mArms) 100 kHz
					20°C	85°C	105°C	-55°C	20°C	105°C		
TCA 2501 226 M ₁ A ₂ 0200	2.5	22	20	A	5.50	55.0	55.0	0.06	0.06	0.09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

Notes : ⁽¹⁾ _1: No code for single item. 'R' and 'N' for taping specification
⁽²⁾ Insert mark for stratification into _2. Example: "7" indicates halogen-free products.
⁽³⁾ Reference value.

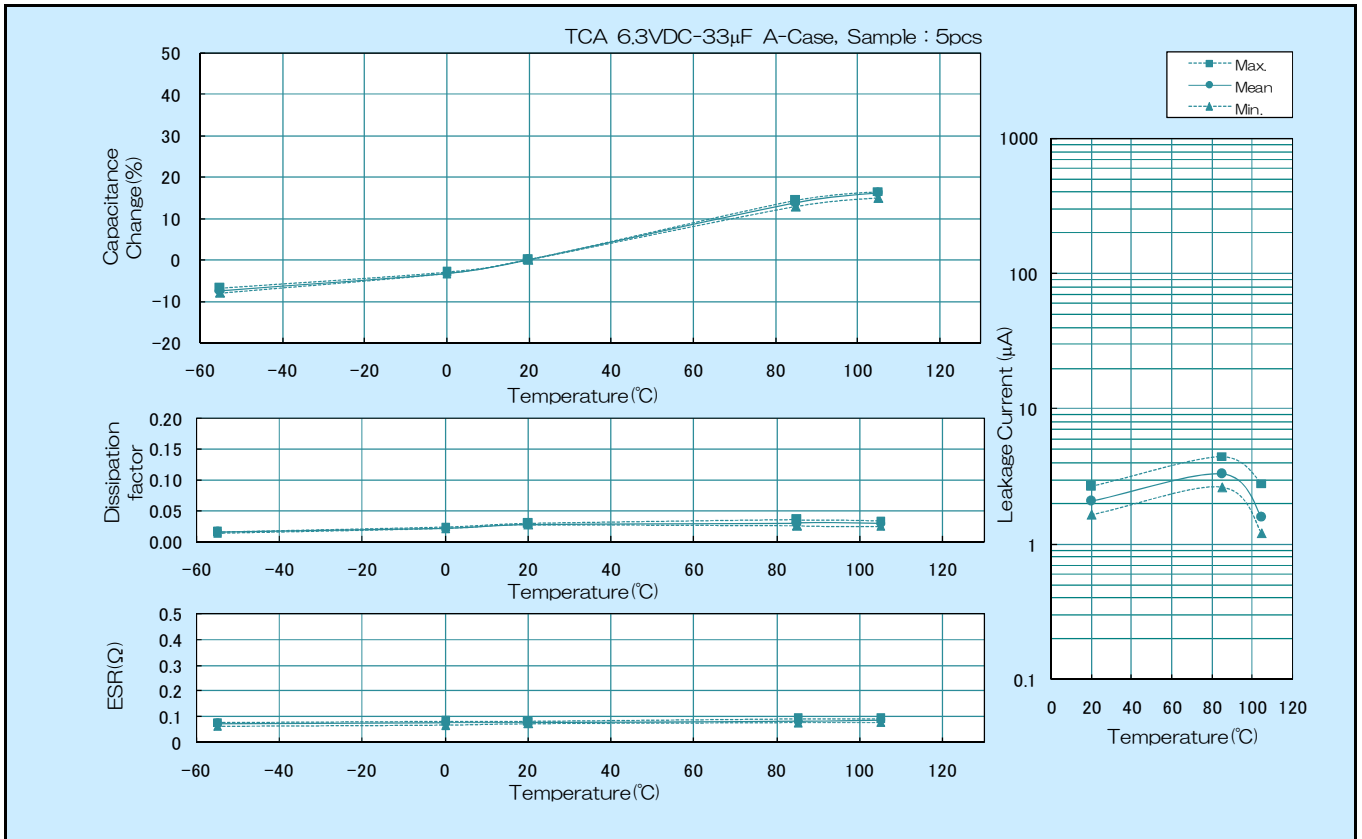
PERFORMANCE

No	Item	Performance			Test Method															
1	Leakage Current (μA)	Shall not exceed 0.1 CV Max. or the values shown in CATALOG NUMBERS AND RATING.			JIS C 5101-1, 4.9 Applied voltage : Rated voltage Duration : 5 min Measuring temperature : 20 ±2°C															
2	Capacitance (μF)	Shall be within specified tolerances.			JIS C 5101-1, 4.7 Measuring frequency : 120 Hz ±20% Measuring temperature : 20 ±2°C															
3	Dissipation Factor	Shall not exceed the values shown in CATALOG NUMBERS AND RATING.			JIS C 5101-1, 4.8 Test conditions shown in No.2															
4	Equivalent Series Resistance	Shall not exceed the values shown in CATALOG NUMBERS AND RATING.			JIS C 5101-1, 4.8 Measuring frequency : 100 kHz ±10% Measuring temperature : 20 ±2°C															
5	Characteristics at High and Low Temperature	Leakage Current	Capacitance	Dissipation Factor	JIS C 5101-1, 4.29															
		Step 1	Shall not exceed the value in No.1.	Within specified tolerances	Shall not exceed the value in No.3.	20 ±2°C														
		Step 2	–	Withi 0/-20% of value at Step 1	Shall not exceed the value in No.3.	-55 ±3°C														
		Step 3	Shall not exceed the value in No.1.	Within ±5% of value at Step 1	Shall not exceed the value in No.3.	20 ±2°C														
		Step 4	Shall not exceed 10-times of the value in No.1.	–	–	85 ±2°C														
		Step 5	Shall not exceed 10-times of the value in No.1.	Within +50/0% of value at Step 1	Shall not exceed 1.5-times of the value in No.3.	105 ±2°C Derated voltage at 105°C														
6	Surge	Leakage current : Shall not exceed 3-times of the value in No.1. Capacitance change : Within ±20% of the value before test Dissipation Factor : Shall not exceed the value in No.3. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.26 Test temperature : 85°C and 105°C Applied voltage : According to the following table <table border="1"> <tr> <td>Rated voltage (VDC)</td> <td>2.5</td> <td>4</td> <td>6.3</td> <td>10</td> </tr> <tr> <td>Surge voltage (VDC)</td> <td>85°C 3.3</td> <td>5.2</td> <td>8.2</td> <td>13</td> </tr> <tr> <td></td> <td>105°C 2.6</td> <td>4.2</td> <td>6.5</td> <td>10.4</td> </tr> </table> Series protective resistance : 1000 Ω Discharge resistance : 1000 Ω	Rated voltage (VDC)	2.5	4	6.3	10	Surge voltage (VDC)	85°C 3.3	5.2	8.2	13		105°C 2.6	4.2	6.5	10.4
Rated voltage (VDC)	2.5	4	6.3	10																
Surge voltage (VDC)	85°C 3.3	5.2	8.2	13																
	105°C 2.6	4.2	6.5	10.4																
7	Shear Test	No separation of terminal from solder.			JIS C 5101-1, 4.34 Force : 5 N Holding time : 5 ±1 sec															
8	Substrate Bending Test	Capacitance : Initial value to remain steady during measurement. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.35 Bending : 3 mm															
9	Vibration	Capacitance : Initial value to remain steady during measurement. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.17 Frequency range : 10-55 Hz Swing width : 1.5 mm Vibration direction : 3 directions with mutually right-angled Duration : 2 hours in each of these mutually perpendicular directions (total 6 hours) Mounting : Solder terminal to the printed board															
10	Shock	There shall be no intermittent contact of 0.5 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 Peak acceleration : 490 m/s ² Duration : 11 ms Wave form : Half-sine															
11	Solderability	Shall be covered to over 3/4 of terminal surface by new soldering.			JIS C 5101-1, 4.15 Solder temperature : 230 ±5°C Dipping time : 3 to 5 seconds Dipping depth : Terminal shall be dipped into melted solder															
12	Resistance to Soldering Heat	Leakage Current : Shall not exceed 2-times of the value in No.1. Capacitance change : Within ±20% of the value before test. Dissipation Factor : Shall not exceed 1.3-times of the value in No.3. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.14 IR reflow Preheating : 140 to 160°C, 110 to 130 sec Reflow : 200°C, 25 to 30 sec Peak : 240°C max. Number of cycles : 2															
13	Component Solvent Resistance	Leakage Current : Shall not exceed the value in No.1. Capacitance change : Within ±20% of the value before test. Dissipation Factor : Shall not exceed the value in No.3.			JIS C 5101-1, 4.31 Temperature : 23 ±5°C Dipping time : 5 ±0.5 min. Conditioning : JIS C 0052 method 2 Solvent : 2-propanol (Isopropyl alcohol)															
14	Solvent Resistance of Marking	Visual examination : After the test the marking shall be legible.			JIS C 5101-1, 4.32 Temperature : 23 ±5°C Dipping time : 5 ±0.5 min. Conditioning : JIS C 0052 method 2 Solvent : 2-propanol (Isopropyl alcohol)															
15	Rapid Change of Temperature	Leakage Current : Shall not exceed 2-times of the value in No.1. Capacitance change : Within ±20% of the value before test. Dissipation Factor : Shall not exceed 1.5-times of the value in No.3. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.16 Step 1 : -55 ±3°C, 30 ±3 min Step 2 : 25 +10/-5°C, 3 min or less Step 3 : 105 ±2°C, 30 ±3 min Step 4 : 25 +10/-5°C, 3 min or less Number of cycles : 5															
16	Damp Heat, Steady State	Leakage Current : Shall not exceed 2-times of the value in No.1. Capacitance change : Within -20% to +40% of the value before test. Dissipation Factor : Shall not exceed 1.5-times of the value in No.3. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.21 Temperature : 40 ±2°C Moisture : 90 to 95% RH Duration : 500 +24/0hrs Measurement after test: After the capacitor being stored under standard atmospheric conditions for 24 hours, leakage current, capacitance and dissipation factor shall be measured.															
17	Endurance I	Leakage Current : Shall not exceed 2-times of the value in No.1. Capacitance change : Within ±20% of the value before test. Dissipation Factor : Shall not exceed 1.5-times of the value in No.3. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.23 Test temperature : 85 ±2°C Applied voltage : Rated voltage Duration : 1000 +48/0hrs Power supply impedance : 3Ω or less Measurement after test: After the capacitor being stored under standard atmospheric conditions for 24 hours, leakage current, capacitance and dissipation factor shall be measured.															
18	Endurance II	Leakage Current : Shall not exceed 2-times of the value in No.1. Capacitance change : Within ±20% of the value before test. Dissipation Factor : Shall not exceed 3-times of the value in No.3. Visual Examination : There shall be no evidence of mechanical damage.			JIS C 5101-1, 4.23 Test temperature : 105 ±2°C Applied voltage : Derated voltage Duration : 1000 +48/0hrs Power supply impedance : 3Ω or less Measurement after test: After the capacitor being stored under standard atmospheric conditions for 24 hours, leakage current, capacitance and dissipation factor shall be measured.															

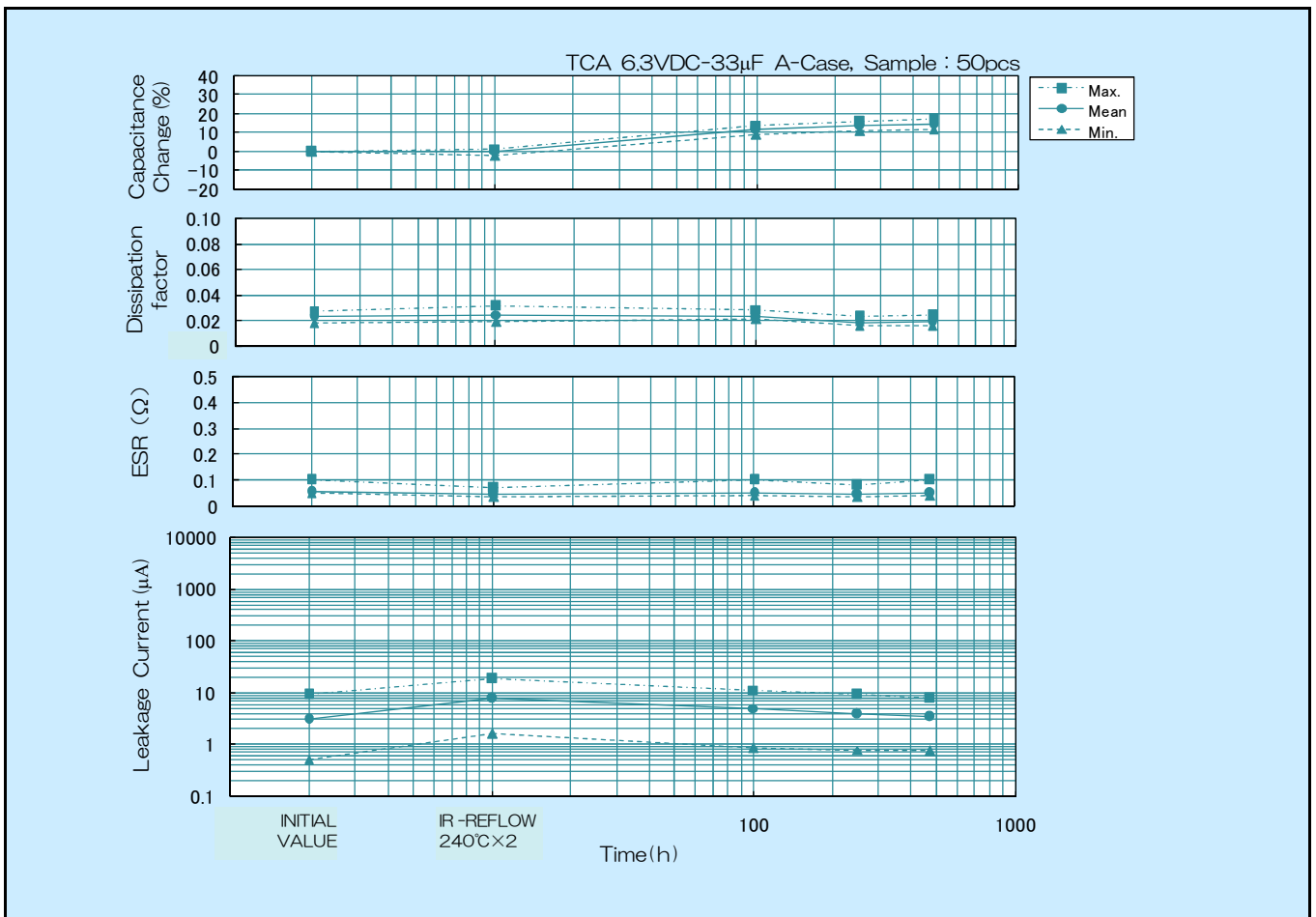
FREQUENCY CHARACTERISTICS



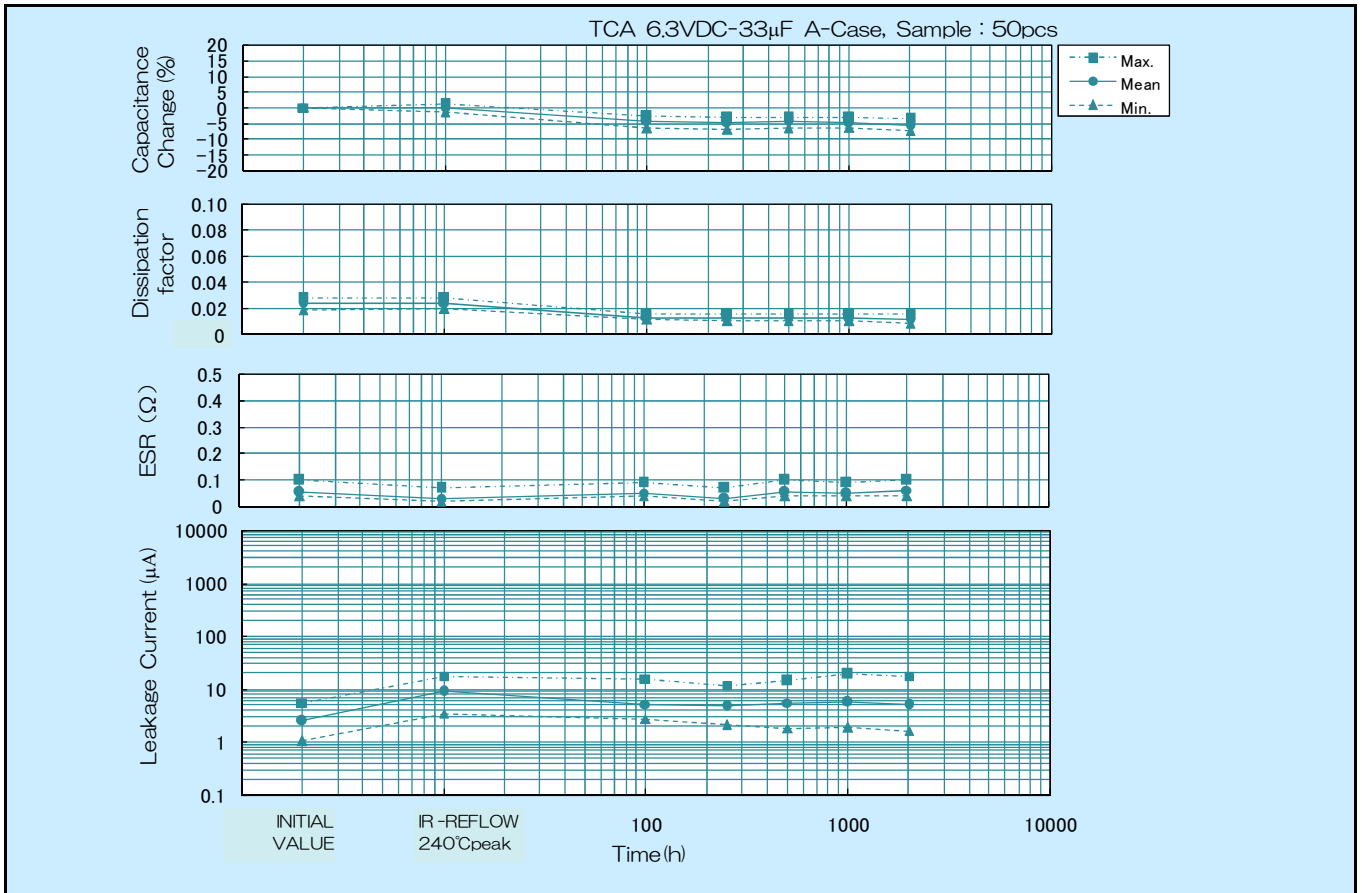
CHARACTERISTICS AT HIGH AND LOW TEMPERATURE



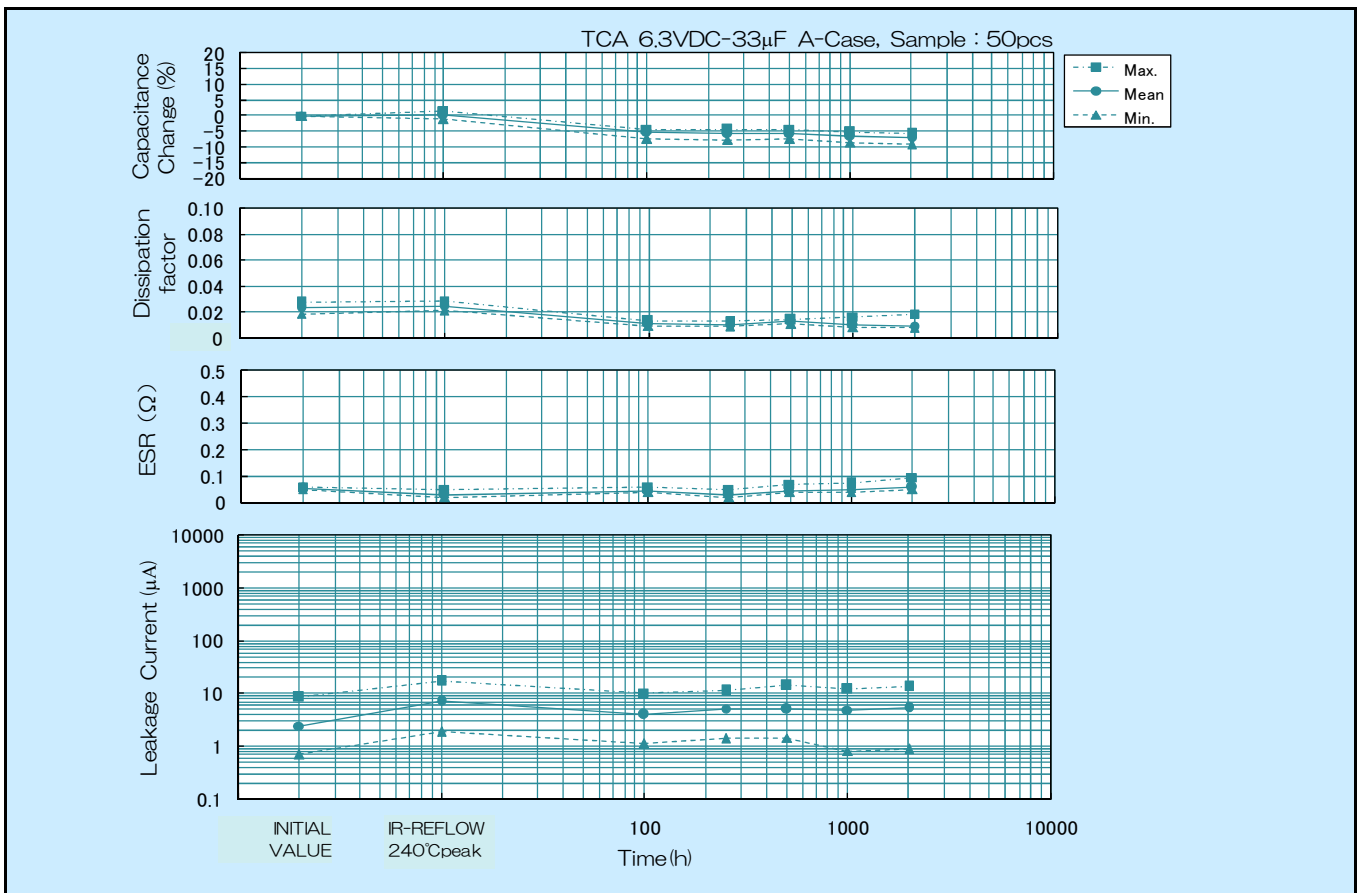
HIGH TEMPERATURE / MOISTURE 40°C , 95%RH



ENDURANCE I 85°C RATED VOLTAGE



ENDURANCE II 105°C DERATED VOLTAGE



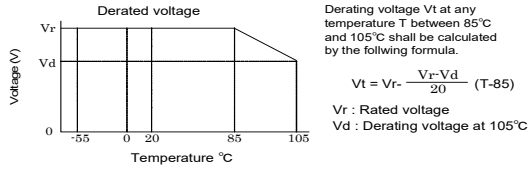


Application Notes for Tantalum Solid Electrolytic Capacitor with Conductive Polymer Type TCA

1. Operating voltage

The capacitors shall be operated at the rated voltage or lower. Over rated voltage applied even for a short time may cause short failure. When designing the circuit, the equipment's required reliability must be considered and appropriate voltage derating must be performed.

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



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

2. Application that contain AC Voltage

Special attention to the following 3 items.

- (1) The sum of the DC bias voltage and the positive peak value of the AC voltage should not exceed the rated voltage.
- (2) Reverse voltage should not exceed the allowable values of the negative peak AC voltage.
- (3) Ripple voltage should not exceed the allowable values.

3. Reverse voltage

Special attention to the polar character. Reverse Voltage should not be applied.

4. Permissible ripple current

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

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

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

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

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 (Ω)
 Z : Impedance at regulated frequency (Ω)

Table 1 Permissible power loss for each case code

Case Code	Pmax (W)
A	0.045
B	0.050
B (25m Ω , 35m Ω)	0.083
C	0.065
D	0.085

Table 2 Pmax multiplier at each operating temperature

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

Note: Above values are measured at 0.8t glass epoxy board mounting in free air and may be changed depending on the kind of board, packing density, and air convection condition. Please consult us if calculated power loss value is equal to or greater than above list of Pmax value.

5. Non Polar Connection

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

6. Soldering

6.1 Preheating

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

6.2 Soldering

The body of the capacitor should not exceed 240°C during soldering.

(1) Reflow Soldering

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

- Direct Heat (Hot plate)
- Atmospheric Heat
 - a) Near and Far IR Ray
 - b) Convection Oven

Vapor Phase Soldering and Flow Soldering are not recommended.

(2) Soldering Iron

Soldering with a soldering iron cannot be recommended due to the lack of consistency in maintaining temperatures and process times. If this method should be necessary, the iron should never touch the capacitor's terminals, and the temperature of the soldering iron should never exceed 350°C. The application of the iron should not exceed 3 seconds and 30 watt.

(3) Please consult us for other methods.

7. Solvent cleaning

Cleaning by organic solvent may damage capacitor's appearance and performance. However, our capacitors are not effected even when soaked at 20-30°C 2-propanol for 5 minutes. When introducing new cleaning methods or changing the cleaning term, please consult us.

8. Ultrasonic cleaning

Ultrasonic cleaning under severe condition may break terminals. Also, from an electrical characteristics aspect, it is unfavorable. Therefore, please do not use ultrasonic cleaning if possible. If the Ultrasonic cleaning process will be used, please note the following.

- (1) The solvent should not be boiled. (Lower the ultrasonic wave output or use solvent with the high boiling point.)
- (2) The recommended wattage is less than 0.5 watts per cm².
- (3) The cleaning time should be kept to a minimum. Also, samples must be swang in the solvent. Please consult us.

9. Storage

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

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

Table 3 MSL&Floor Life

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

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

10. Inapplicable circuits

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

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

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

11. Additional Notes

Wear-out failure (Lifetime)

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

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

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



MATSUO ELECTRIC CO., LTD.

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

Overseas Sales 5-3,3-Chome,Sennari-cho,Toyonaka-shi,Osaka 561-8558,Japan Tel:06-6332-0883 Fax:06-6332-0920
Head office 5-3,3-Chome,Sennari-cho,Toyonaka-shi,Osaka 561-8558,Japan Tel:06-6332-0871 Fax:06-6331-1386
URL <https://www.ncc-matsuo.co.jp/>

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

適用用途分類 / APPLICATION CLASSIFICATION BY USE

Rev.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"> 高度な安全性や信頼性が要求される機器 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 	<ul style="list-style-type: none"> 宇宙開発機器関連(衛星、ロケット、人工衛星) 航空・防衛システム 原子力・火力・水力発電システム 	267型Pシリーズ	該当なし
車載・産業機器	2	<ul style="list-style-type: none"> 信頼性が重視される機器 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 	<ul style="list-style-type: none"> 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) 新幹線・主要幹線の運行制御システム 	267型Nシリーズ 271型Nシリーズ	JAG型Nシリーズ JAJ型Nシリーズ JAK型Nシリーズ JHC型Nシリーズ KAB型Nシリーズ KVA型Nシリーズ
	3-A	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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安全管理が要求される機器 	<ul style="list-style-type: none"> 家庭用/ビル用等のセキュリティ管理システム 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 279型 281型MEシリーズ TCA型 TCD型	JHC型
汎用機器	4	<ul style="list-style-type: none"> 最先端技術を積極的に適用する小型・薄型品 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 	<ul style="list-style-type: none"> 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 デスクトップPC、ノートPC、ホームネットワーク アミューズメント機器(パチンコ、ゲーム機) 	251型Mシリーズ 267型Cシリーズ TCB型	JAE型、JAG型 JAJ型、JAK型 KAB型 KAB型Tシリーズ 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"> - Apparatus in which advanced safety and reliability are demanded. - 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. 	<ul style="list-style-type: none"> - Space development apparatus relation (Satellite, Rocket, Artificial Satellite) - Aviation and a defensive system - Atomic power, fire power, and a water-power generation system 	Type 267 P Sereis	With no relevance
In-vehicle Industrial apparatus	2	<ul style="list-style-type: none"> - Apparatus in which reliability is important. - 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. 	<ul style="list-style-type: none"> - Vehicles control of transport machines, such as a car, and a railroad, a vessel (Engine control, drive control, brake control) - The operation control system of the Shinkansen and a main artery 	Type 267 N Sereis Type 271 N Sereis	Type JAG N series Type JAJ N series Type JAK N series Type JHC N series Type KAB N series Type KVA N series
	3-A	<ul style="list-style-type: none"> - General electrical equipment designed for use in vehicles but used in the interior environment 	<ul style="list-style-type: none"> - Vehicle indoor loading parts, such as an air-conditioner and car navigation, and in-vehicle communication facility 		Type KAB M series
	3-B	<ul style="list-style-type: none"> -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"> - Security management system for home/buildings etc. - Control apparatus, such as Industrial use robots and a machine tool etc. 	Type 267 M.E Sereis Type 279 Type 281 M.E Sereis Type TCA Type TCD	Type JHC
Apparatus in general	4	<ul style="list-style-type: none"> - The small size and the thin article which applies leading-edge technology positively - 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. 	<ul style="list-style-type: none"> -Smart phone, Mobile phone, Mobile PC (tablet), Electronic dictionary - Desktop PC, Notebook PC, Home network - Amusement apparatus (Pachinko, Game machine) 	Type 251 M Series Type 267 C Series Type TCB	Type JAE, Type JAG Type JAJ, Type JAK Type KAB Type KAB T series 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 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P ₁ (mm)	P ₂ (mm)	P ₀ (mm)	φD ₀ (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
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 ^{+0.1} ₀	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 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P ₁ (mm)	P ₂ (mm)	P ₀ (mm)	D ₀ (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
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	φ1.5 ^{+0.1} ₀	2,000	9,000
B	3.5×2.8				8.0±0.1				500	
C3	6.0×3.2									
D3	7.3×4.4									
H	7.3×4.4	12.0±0.3	5.7±0.05	1.5±0.1	8.0±0.1	500				
E	7.3×5.8									

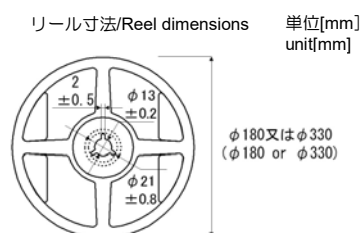
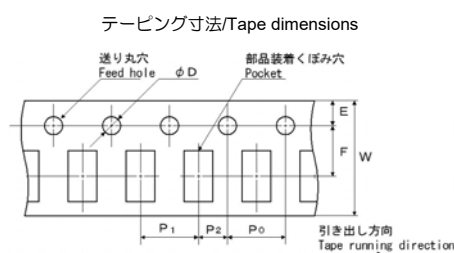
定格：267型Nシリーズ, TCA型
Type : 267 N Series, TCA

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P ₁ (mm)	P ₂ (mm)	P ₀ (mm)	D ₀ (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
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	φ1.5 ^{+0.1} ₀	2,000	9,000
B	3.5×2.8				8.0±0.1				500	
C	6.0×3.2									
D	7.3×4.4									

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 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P ₁ (mm)	P ₂ (mm)	P ₀ (mm)	D ₀ (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									φ180	φ330
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	φ1.55±0.03	5,000	-
31	2.0×1.25								500	
52	3.2×1.6									
44E	7.3×5.8	12±0.3	5.5±0.05	1.75±0.1	8.0±0.1					
59F	11.0×7.3					24±0.3	11.5±0.05	12.0±0.1	φ1.5 ^{+0.1} ₀	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

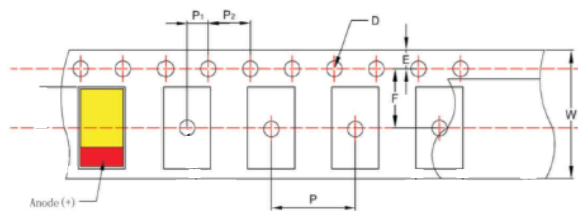
φ180リール φ180Reel	φ330リール φ330Reel	極性 Anode notation
L	P	送り穴側 + Feed hole +
R	N	送り穴側 - Feed hole -

チップタンタルコンデンサ
Chip Tantalum Capacitors

定格：TCD型
Type：TCD

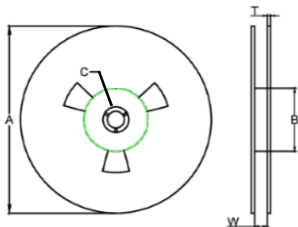
ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P (mm)	P ₁ (mm)	P ₂ (mm)	φ D (mm)	包装数/リール(個) Quantity/Reel (pcs)
									φ 180
B	3.5×2.8×2.1	8±0.30	3.5±0.05	1.75±0.10	4±0.10	4±0.10	2±0.10	1.55±0.20	2,000
D	7.3×4.3×2.8	12±0.30	5.5±0.05	1.75±0.10	4±0.10	8±0.10	2±0.10	1.55±0.20	500

テーピング寸法/Tape dimensions



単位[mm]
unit[mm]

リール寸法/Reel dimensions



リール Reel	テープ幅 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