OUTLINE(Type TCB)

Type TCB is a tantalum solid electrolytic capacitor with face-down terminal which uses conductive polymer as cathode layer.
Their equivalent series resistance (ESR) is extremely lowered with 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, smart 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 TCB 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. Ultra Compact and Large capacitance
   The face-down terminal structure makes it possible to design land almost in same size as terminals. As result, components can be downsized, and mounting area can be reduced to 1/2 to 1/3 compared to the conventional structures.
4. Flame Retardancy
   Type TCB 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. Perfect Lead Free and RoHS Compliant.

RATING

Item	Rating
Failure Rate Level	1% / 1000 h
Category Temperature Range	-55 to +105°C (to be used at derated voltage when temperature exceeds Rated Temperature)
Rated Temperature	+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	4.7～220 μF
Capacitance Tolerances	±20% (M)

* Rated temperature and the Derated voltage include a different thing by a specification number.
Please refer to application notes in the use.

ORDERING INFORMATION

TCB	1002	226	M	R	10A	50	0150
TYPE	RATED VOLTAGE	CAPACITANCE	CAPACITANCE TOLERANCE	STYLE OF REELED PACKAGE	CASE CODE	SPECIFICATION NUMBER	ESR（mΩ）

Rated voltage	Marking
2.5V	2501
4V	4001
6.3V	6301
10V	1002

Capacitance	Marking
4.7 μF	475
6.8 μF	685
10μF	106
15μF	156
22μF	226
33μF	336
47μF	476
68μF	686
100μF	107
220μF	227

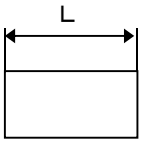
Capacitance Tolerance	Marking
±20%	M

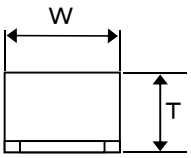
Anode Notation	Reel Size	Code
Feed hole: -	φ180 Reel	R

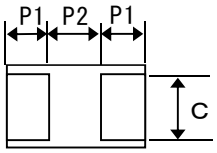
Case Code	Height of component max. (mm)	EIA Code
06U	0.6	1005
09M	0.9	1608
10M	1.0	1608
10S	1.0	2012
12S	1.2	2012
13S	1.3	2012
10A	1.0	3216L
12A	1.2	3216L
13A	1.3	3216

Specification Number	Specification Contents
Blanks	Dimensional tolerance of L and W ±0.1mm (U Case ±0.05mm) Rated Temperature +85℃
08	Dimensional tolerance of L and W ±0.1mm Rated Temperature +65℃
50	Dimensional tolerance of L and $W^{+0.2}_{-0.0}$ mm Rated Temperature +85℃

DIMENSIONS







[Standard Rating] (mm)

Case Code	EIA Code	Max.height	L ± 0.1	W ± 0.1	T ± 0.1	P_1 ± 0.1	P_2 ± 0.1	C ± 0.1
06U	1005	0.6	1.05±0.05	0.55±0.05	0.55±0.05	0.3	0.45	0.4
09M	1608	0.9	1.6	0.85	0.8	0.5	0.65	0.7
12S	2012	1.2	2	1.25	1.1	0.5	1.05	0.9
12A	3216L	1.2	3.2	1.6	1.1	0.8	1.65	1.2

[Low Profile Rating] (mm)

Case Code	EIA Code	Max.height	L ± 0.1	W ± 0.1	T ± 0.1	P_1 ± 0.1	P_2 ± 0.1	C ± 0.1
10S	2012	1.0	2	1.25	0.9	0.5	1.05	0.9
10A	3216L	1.0	3.2	1.6	0.9	0.8	1.65	1.2

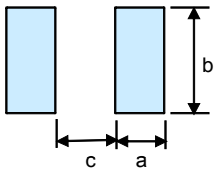
[Custom Profile Rating][Specification Number 08 Profile Rating] (mm)

Case Code	EIA Code	Max.height	L ± 0.1	W ± 0.1	T ± 0.1	P_1 ± 0.1	P_2 ± 0.1	C ± 0.1
13S	2012	1.3	2	1.25	1.2	0.5	1.05	0.9
13A	3216	1.3	3.2	1.6	1.2	0.8	1.65	1.2

[Specification Number 50 Profile Rating] ※Dimensional Tolerance of Specification Number 50 is as below. (mm)

Case Code	EIA Code	Max.height	L $^{+0.2}_{-0.0}$	W $^{+0.2}_{-0.0}$	T ± 0.1	P_1 ± 0.1	P_2 ± 0.1	C ± 0.07
10M	1608	1.0	1.6	0.85	0.9	0.5	0.75	0.65
12S	2012	1.2	2	1.25	1.1	0.5	1.15	0.9

RECOMMENDED SOLDER PAD LAYOUT



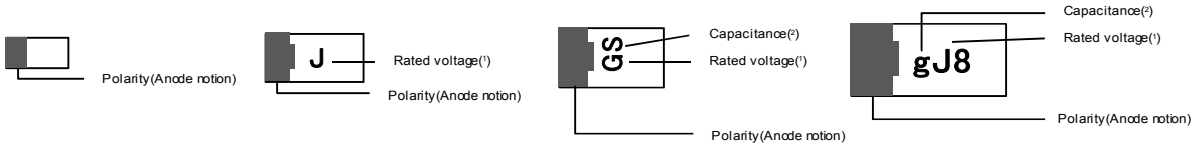
(mm)

Case Code	a	b	c
06U	0.30 or more	0.3	0.45
09M	0.50 or more	0.65	0.65
10M（Spec. Number 50）	0.50 or more	0.65	0.75
10S,12S,13S	0.50 or more	0.8	1.05
12S（Spec. Number 50）	0.50 or more	0.8	1.15
10A,12A,13A	0.80 or more	1.1	1.65

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.
Adjust the mask opening so that the mask thickness is equivalent to 100μm.

MARKING

[U case] [M case] [S case] [A case]



(1) Rated voltage is indicated with one alphabetic letter.

Rated voltage (VDC)	Ucase	Mcase ,Scase	Acase
2.5		e	
4		G	
6.3	non	J	j
10		A	A

(2)Capacitance is shown by the code below.

Capacitance (μF)	Ucase,Mcase	Scase	Acase
4.7	non		
6.8	non		
10	non		
15	non		
22	non	J	J7
47	non		S7
68			W7
100		A	A8
220			J8

RATING

Jul. , 2018

[STANDARE RATING]

R.V.(VDC) / Cap.(μF)	2.5	4	6.3	10
4.7	09M(200,500)	09M(200,500)	06U(500) 09M(200,500)	09M(200,500)
6.8	09M(200,500)	09M(200,500)	09M(200,500)	09M(200,500)
10	09M(200,500)	09M(200,500)	09M(200,500)	09M(200)
15	09M(200,500)	09M(200,500)		
22			09M(200)	12S(150)
47				12A(150,250)
68			12A(150)	

[LOW PROFILE RATING]

R.V.(VDC) / Cap.(μF)	2.5	4	6.3	10
22			10S(150)	10A(60,150)

[CUSTOM PROFILE RATING]

R.V.(VDC) / Cap.(μF)	2.5	4	6.3	10
100			13S(200)	

[SPECIFICATION NUMBER 08 PROFILE RATING]

R.V.(VDC) / Cap.(μF)	2.5	4	6.3	10
220			13A(150)	

[SPECIFICATION NUMBER 50 PROFILE RATING]

R.V.(VDC) / Cap.(μF)	2.5	4	6.3	10
47			10M(200)	
100			12S(200)	

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

CATALOG NUMBERS AND RATING

Jun. , 2017

Catalog number(1)	Rated voltage (VDC)	Capacitance (μF)	Tolerance (±%)	Case code	Lct. (μA)			Max. Dissipation factor			ESR(mΩ) 100 kHz	Max.permissible Ripple Current(2) (mArms)
					20℃	85℃	125℃	-55℃	20℃	85℃		
TCB 2501 475 M _1 09M 0500	2.5	4.7	20	09M	1.18	11.8	11.8	0.10	0.10	0.15	500	316
TCB 2501 475 M _1 09M 0200	↓	4.7	↓	09M	1.18	11.8	11.8	0.10	0.10	0.15	200	500
TCB 2501 685 M _1 09M 0500	↓	6.8	↓	09M	1.70	17.0	17.0	0.10	0.10	0.15	500	316
TCB 2501 685 M _1 09M 0200	↓	6.8	↓	09M	1.70	17.0	17.0	0.10	0.10	0.15	200	500
TCB 2501 106 M _1 09M 0500	↓	10	↓	09M	2.50	25.0	25.0	0.10	0.10	0.15	500	316
TCB 2501 106 M _1 09M 0200	↓	10	↓	09M	2.50	25.0	25.0	0.10	0.10	0.15	200	500
TCB 2501 156 M _1 09M 0500	↓	15	↓	09M	3.75	37.5	37.5	0.10	0.10	0.15	500	316
TCB 2501 156 M _1 09M 0200	↓	15	↓	09M	3.75	37.5	37.5	0.10	0.10	0.15	200	500
TCB 4001 475 M _1 09M 0500	4	4.7	20	09M	1.88	18.8	18.8	0.10	0.10	0.15	500	316
TCB 4001 475 M _1 09M 0200	↓	4.7	↓	09M	1.88	18.8	18.8	0.10	0.10	0.15	200	500
TCB 4001 685 M _1 09M 0500	↓	6.8	↓	09M	2.72	27.2	27.2	0.10	0.10	0.15	500	316
TCB 4001 685 M _1 09M 0200	↓	6.8	↓	09M	2.72	27.2	27.2	0.10	0.10	0.15	200	500
TCB 4001 106 M _1 09M 0500	↓	10	↓	09M	4.00	40.0	40.0	0.10	0.10	0.15	500	316
TCB 4001 106 M _1 09M 0200	↓	10	↓	09M	4.00	40.0	40.0	0.10	0.10	0.15	200	500
TCB 4001 156 M _1 09M 0500	↓	15	↓	09M	6.00	60.0	60.0	0.10	0.10	0.15	500	316
TCB 4001 156 M _1 09M 0200	↓	15	↓	09M	6.00	60.0	60.0	0.10	0.10	0.15	200	500
TCB 6301 475 M _1 06U 0500	6.3	4.7	20	06U	2.96	29.6	29.6	0.10	0.10	0.15	500	245
TCB 6301 475 M _1 09M 0500	↓	4.7	↓	09M	2.96	29.6	29.6	0.10	0.10	0.15	500	316
TCB 6301 475 M _1 09M 0200	↓	4.7	↓	09M	2.96	29.6	29.6	0.10	0.10	0.15	200	500
TCB 6301 685 M _1 09M 0500	↓	6.8	↓	09M	4.28	42.8	42.8	0.10	0.10	0.15	500	316
TCB 6301 685 M _1 09M 0200	↓	6.8	↓	09M	4.28	42.8	42.8	0.10	0.10	0.15	200	500
TCB 6301 106 M _1 09M 0500	↓	10	↓	09M	6.30	63.0	63.0	0.10	0.10	0.15	500	316
TCB 6301 106 M _1 09M 0200	↓	10	↓	09M	6.30	63.0	63.0	0.10	0.10	0.15	200	500
TCB 6301 226 M _1 09M 0200	↓	22	↓	09M	13.8	138	138	0.10	0.10	0.15	200	500
TCB 6301 226 M _1 10S 0150	↓	22	↓	10S	13.8	138	138	0.06	0.06	0.09	150	658
TCB 6301 476 M _1 10M 50 0200	↓	47	↓	10M	59.2	592	592	0.10	0.10	0.15	200	500
TCB 6301 686 M _1 12A 0150	↓	68	↓	12A	42.8	428	428	0.08	0.08	0.12	150	721
TCB 6301 107 M _1 12S 50 0200	↓	100	↓	12S	126.0	1260	1260	0.10	0.10	0.15	200	570
TCB 6301 107 M _1 13S 0200	↓	100	↓	13S	126.0	1260	1260	0.10	0.10	0.15	200	570
TCB 6301 227 M _1 13A 08 0150	↓	220	↓	13A	277	2770	2770	0.20	0.20	0.30	150	721
TCB 1002 475 M _1 09M 0500	10	4.7	20	09M	4.70	47.0	47.0	0.10	0.10	0.15	500	316
TCB 1002 475 M _1 09M 0200	↓	4.7	↓	09M	4.70	47.0	47.0	0.10	0.10	0.15	200	500
TCB 1002 685 M _1 09M 0500	↓	6.8	↓	09M	6.80	68.0	68.0	0.10	0.10	0.15	500	316
TCB 1002 685 M _1 09M 0200	↓	6.8	↓	09M	6.80	68.0	68.0	0.10	0.10	0.15	200	500
TCB 1002 106 M _1 09M 0200	↓	10	↓	09M	10.0	100	100	0.10	0.10	0.15	200	500
TCB 1002 226 M _1 10A 0150	↓	22	↓	10A	22.0	220	220	0.06	0.06	0.09	150	721
TCB 1002 226 M _1 10A 0060	↓	22	↓	10A	22.0	220	220	0.06	0.06	0.09	60	1140
TCB 1002 226 M _1 12S 0150	↓	22	↓	12S	22.0	220	220	0.06	0.06	0.09	150	658
TCB 1002 476 M _1 12A 0150	↓	47	↓	12A	47.0	470	470	0.08	0.08	0.12	150	721
TCB 1002 476 M _1 12A 0250	↓	47	↓	12A	47.0	470	470	0.08	0.08	0.12	250	558

Notes : (1)_1:No code for single item. 'R' for taping specification.

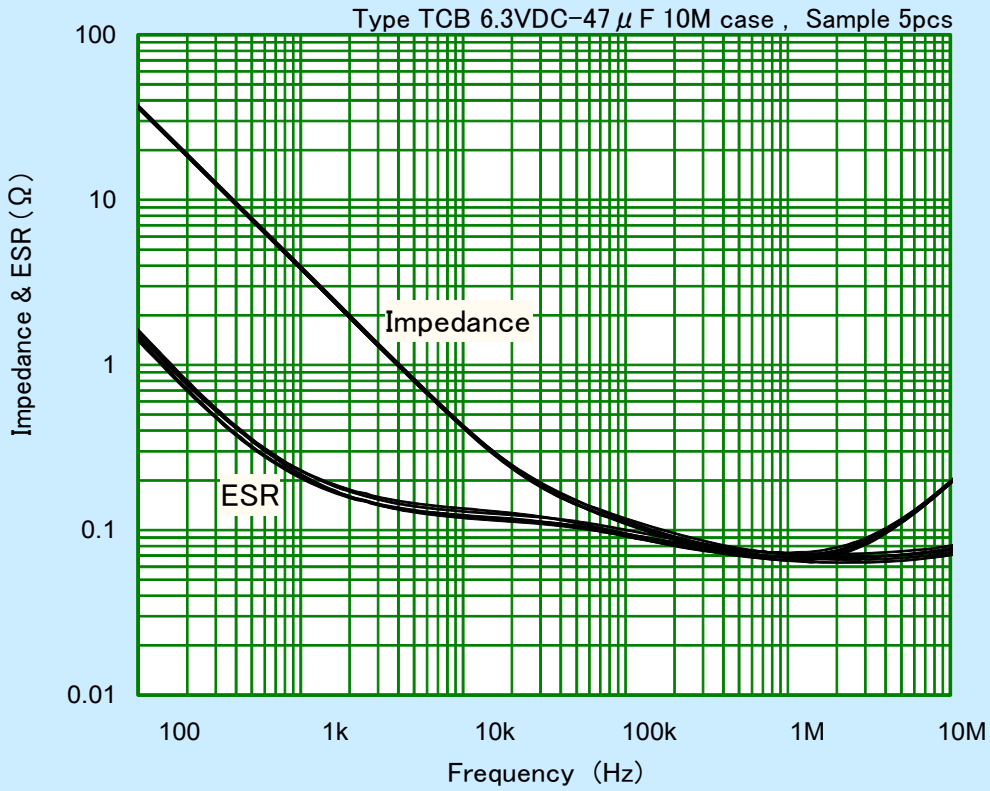
(2) Reference value.

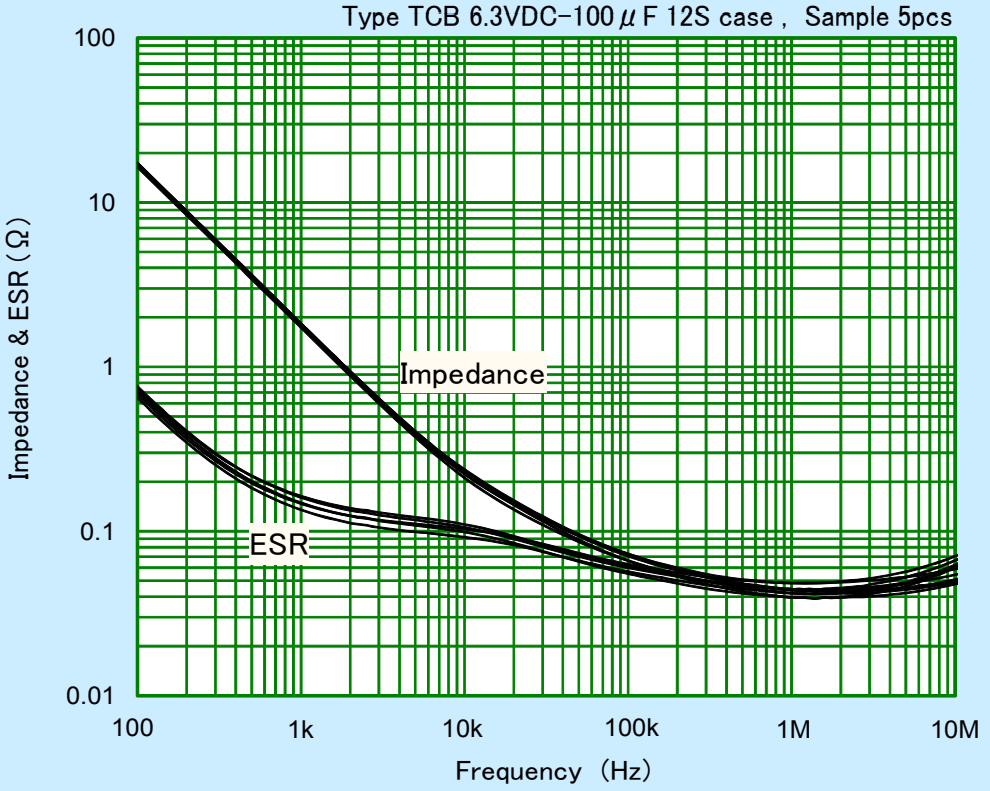
PERFORMANCE

No	Item		Performance	Test Method
1	Leakage Current (μA)		Shall not exceed 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			JIS C 5101-1, 4.29
	Step 1	Leakage Current Capacitance Dissipation Factor	Shall not exceed the value in No.1. Within specified tolerances Shall not exceed the value in No.3.	20±2°C
	Step 2	Capacitance Dissipation Factor	Within $^{0}_{-20}$ % of value at Step 1 Shall not exceed the value in No.3.	-55±3°C
	Step 3	Leakage Current Capacitance Dissipation Factor	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	Leakage Current	Shall not exceed 10-times of the value in No.1.	85±2°C *Specification Number 08 : 65±2°C
	Step 5	Leakage Current Capacitance Dissipation Factor	Shall not exceed 10-times of the value in No.1. Within $^{+10}_{0}$ % 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
	Step 6	Leakage Current Capacitance Dissipation Factor	Shall not exceed the value in No.1. Within ± 5% of value at Step 1 Shall not exceed the value in No.3.	20±2°C
6	Surge	Leakage current Capacitance change Dissipation Factor Visual Examination	Shall not exceed 3-times of the value in No.1. Within ±20% of the value before test. Shall not exceed the value in No.3. 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 Rated voltage (VDC) | 2.5 | 4 | 6.3 | 10 Surge voltage (VDC) 85℃ | 3.3 | 5.2 | 8.2 | 13 Surge voltage (VDC) 105℃ | 2.6 | 4.2 | 6.5 | 10.4 *Specification Number 08 Rated voltage (VDC) | 6.3 Surge voltage (VDC) 65℃ | 8.2 Series protective resistance : 1000Ω Discharge resistance : 1000Ω
7	Shear Test		There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.34 Force : U case: 2N, M/S/A case: 5N Holding time : 10±1 sec
8	Substrate Bending Test	Capacitance Visual Examination	Initial value to remain steady during measurement. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.35 Bending : 1 mm
9	Vibration	Capacitance Visual Examination	Initial value to remain steady during measurement. 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 erpendicular 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		Solder shall be in close contact with terminal (pinholes, non-solderability and solder repelling are not allowed). (1) Note (1) : If any question arises relating to the judgment, make sure that the part dipped in solder, more than 3/4 of the terminal surface, is covered with new solder.	JIS C 5101-1 4.15 Solder temperature : 235±5°C Dipping time : 2±0.5 sec Dipping depth : Terminal shall be dipped into melted solder
12	Resistance to Soldering Heat	Leakage Current Capacitance change Dissipation Factor Visual Examination	Shall not exceed 2-times of the value in No.1. For Specification Number 50 & 08 and TCB 6.3V-100μF 13S, Leakage Current is less than 3 times of value shown in No.1. Within ±20% of the value before test. Shall not exceed 1.3-times of the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.14 IR reflow Preheating : 150 to 200°C, 180 sec.(max.) Reflow : 217°C,90 sec.(max.) Peak : 260°C 5sec.(max.) Number of cycles : 2
13	Component solvent resistance	Leakage Current Capacitance change Dissipation Factor	Shall not exceed the value in No.1. Within ±20% of the value before test. 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-proparol (Isopropyl alcohol)

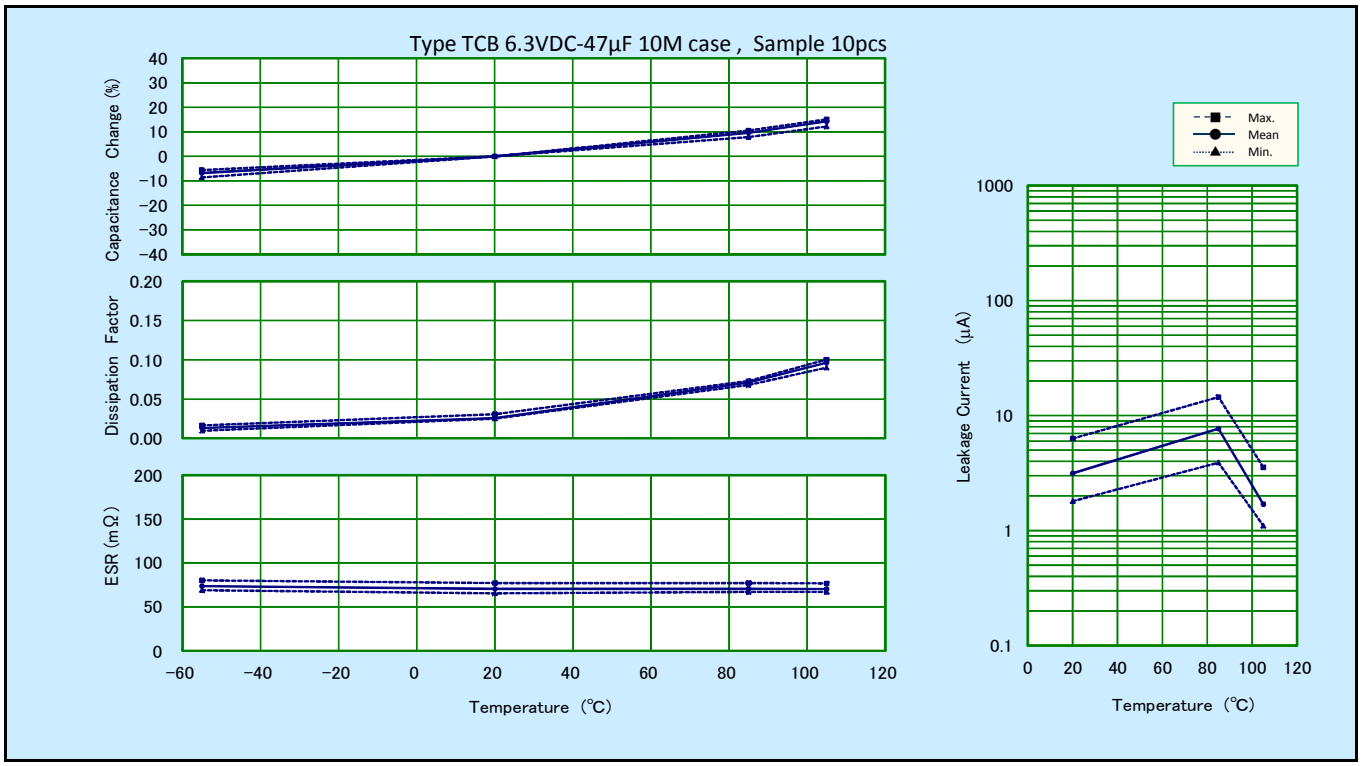
No	Item		Performance	Test Method
14	Solvent resistance of marking	Visual examination	After the test the marking shall be legible.	JIS C 5101-1 4.32 Temperature : 23±5°C Dipping time : 5±0.5 min. Conditioning : JIS C 0052 method 2 Solvent : 2-proparol (Isopropyl alcohol)
15	Rapid Change of Temperature	Leakage Current Capacitance change Dissipation Factor Visual Examination	Shall not exceed 2-times of the value in No.1. For Specification Number 50 & 08 and TCB 6.3V-100μF 13S, Leakage Current is less than 3 times of value shown in No.1. Within ±20% of the value before test. Shall not exceed 1.5-times of the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.16 Step 1 : -55±3℃ , 30±3 min Step 2 : 25 $^{+10}_{-5}$ ℃, 3 min or less Step 3 : 105±2 ℃, 30±3 min Step 4 : 25 $^{+10}_{-5}$ ℃, 3 min or less Number of cycles : 5
16	Damp Heat, Steady State	Leakage Current Capacitance change Dissipation Factor Visual Examination	Shall not exceed 2-times of the value in No.1. For Specification Number 50 & 08 and TCB 6.3V-100μF 13S, Leakage Current is less than 3 times of value shown in No.1. Within -20% to +40% of the value before test. Shall not exceed 1.5-times of the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.22 Temperature : 40±2°C Moisture : 90 to 95% RH Duration : 500 $^{+24}_{0}$ hrs
17	Endurance I	Leakage Current Capacitance change Dissipation Factor Visual Examination	Shall not exceed 2-times of the value in No.1. For Specification Number 50 & 08 and TCB 6.3V-100μF 13S, Leakage Current is less than 3 times of value shown in No.1. For TCB 6.3V-22μF 09M, Leakage Current is less than 4 times of value shown in No.1. Within ±20% of the value before test. Shall not exceed 1.5-times of the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.23 Test temperature : Rated temperature Applied voltage : Rated voltage Duration : 1000 $^{+48}_{0}$ hrs Power supply impedance : 3Ω or less
18	Endurance II	Leakage Current Capacitance change Dissipation Factor Visual Examination	Shall not exceed 2-times of the value in No.1. For Specification Number 50 and TCB 6.3V-100μF 13S, Leakage Current is less than 3 times of value shown in No.1. For TCB 6.3V-22μF 09M, Leakage Current is less than 4 times of value shown in No.1. Within ±20% of the value before test. Shall not exceed 3-times of the value in No.3. There shall be no evidence of mechanical damage. * specification number 08 articles do not apply it.	JIS C 5101-1, 4.23 Test temperature : 105±2°C Applied voltage : Derated voltage Duration : 1000 $^{+48}_{0}$ hrs For 6.3V-100μF 13S : 240±8 hrs Power supply impedance : 3Ω or less

FREQUENCY CHARACTERISTICS

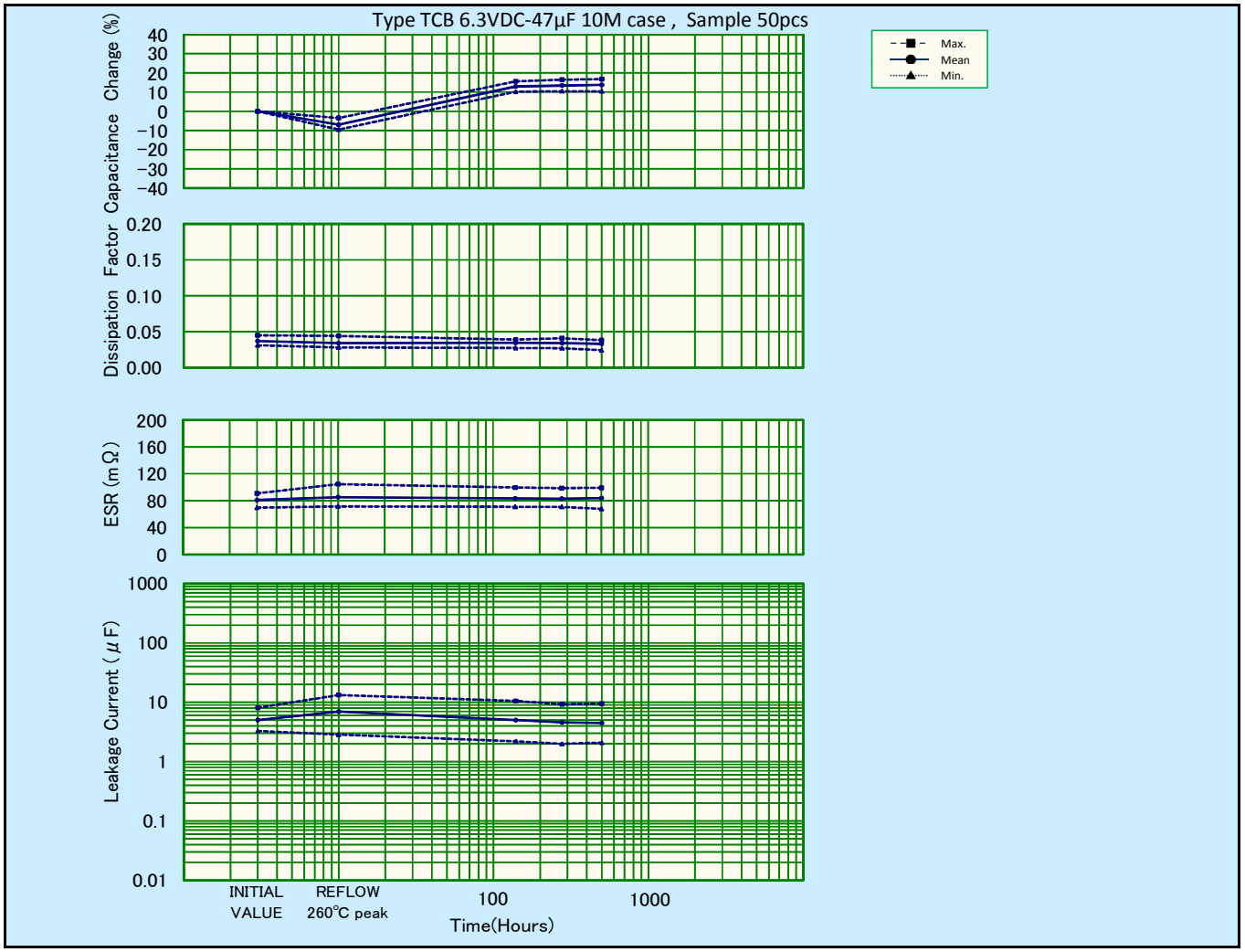




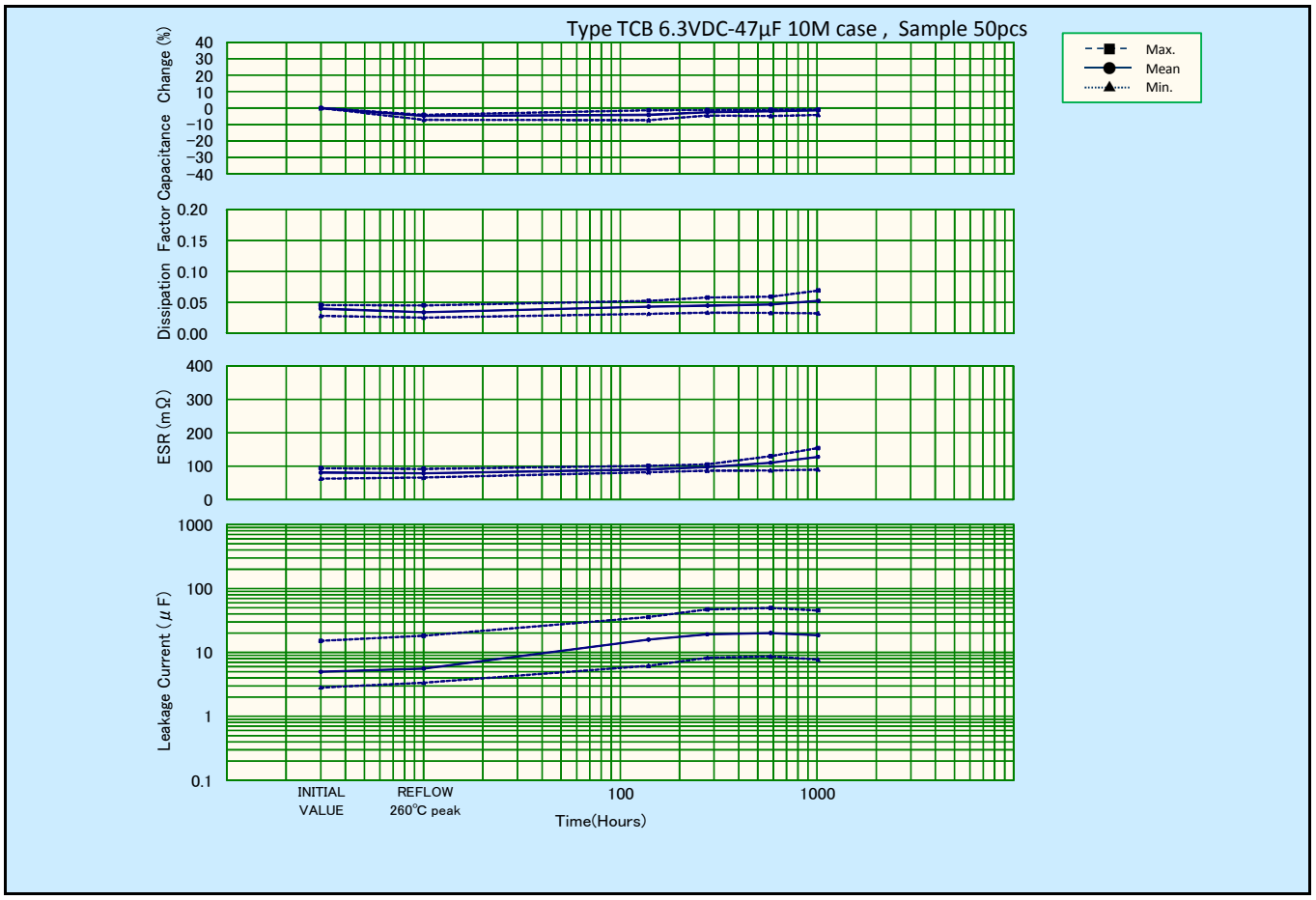
CHARACTERISTICS AT HIGH AND LOW TEMPERATURE



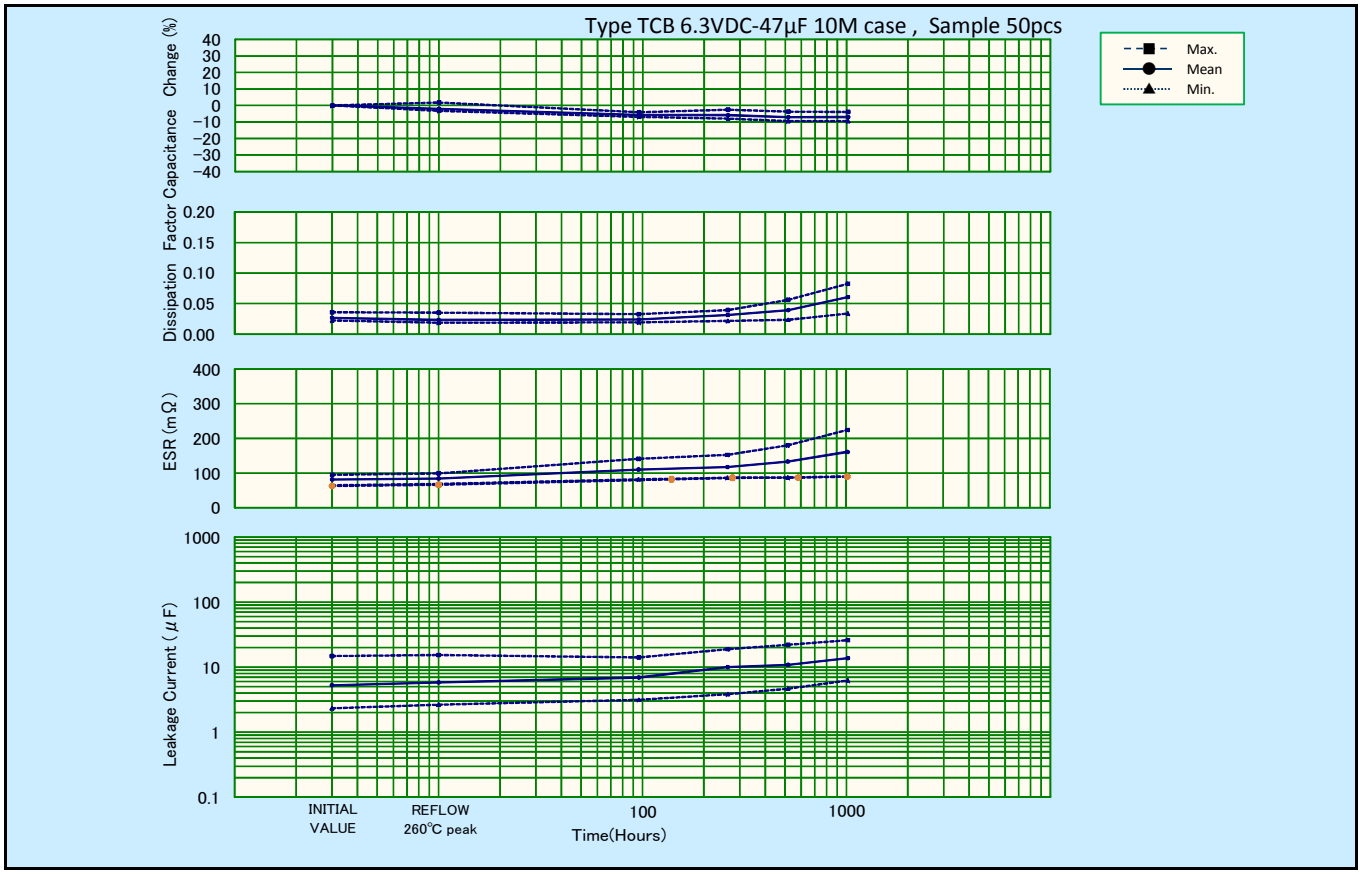
DAMP HEAT STEADY STATE 40℃ , 95%RH



ENDURANCE Ⅰ 85℃ RATED VOLTAGE



ENDURANCE Ⅱ 105℃ DERATED VOLTAGE

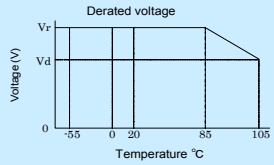


Application Notes for Tantalum Solid Electrolytic Capacitor with Conductive Polymer

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.



Derating voltage Vt at any temperature T between 85℃ and 105℃ shall be calculated by the follwing formula.

$$Vt = Vr - \frac{Vr-Vd}{20} \quad (T\text{-}85)$$

Vr : Rated voltage
Vd : Derating voltage at 105℃

Property value of the specification number

Specification Number	Rated Temperature		Rated voltage (VDC)				
			Temperature	2.5	4.0	6.3	10.0
Blanks,50	+85℃	Derated voltage (VDC)	+105℃	2.0	3.2	5.0	8.0
08	+65℃		+85℃	-	-	4.5	-
			+105℃	-	-	3.3	-

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 size (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.

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

$$\text{Permissible ripple current } Imax = \sqrt{\frac{P\,max}{ESR}} \quad (Arms)$$

$$\text{Permissible ripple voltage } Emax = \sqrt{\frac{P\,max}{ESR}} \times Z = Imax \times Z \; (Vrms)$$

I max: Permissible ripple current at regulated frequency (Arms : RMS value)
Emax: Permissible ripple voltage at regulated frequency (Vrms : RMS value)
Pmax: 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 size

Case size	Pmax（W）
06U	0.03
09M	0.05
09M,10M（Specification Number 500）	0.057
09S,10S,12S,13S	0.065
09A,10A,12A,13A	0.078

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 P max value.

Table 2 Pmax multiplier at each operating temperature

Operating temperature（℃）	Multiplier
25	1
55	0.9
85	0.8
125	0.4

5. Non Polar Connection

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

6. Soldering

6.1 Preheating

To obtain optimal reliability, lowering the heat shock during the soldering process is favorable. Capacitors should be pre-heated at 130-160 C for approximately 60 seconds.

6.2 Soldering

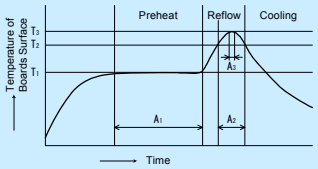
The body of the capacitor should not exceed 260 C during soldering. Leakage current can be increased slightly due to the soldering heat. In this case, leakage current will be decreased gradually when leaving capacitors in the normal temperature and humidity adequately.

(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.
Recommended condition by IR Re-flow procedure is shown in picture-1.



Temperature	Time
T1= 150℃～200℃	A1=180sec.(max.)
T2= 217℃	A2=90sec.(max.)
T3= 260℃	A3=5sec.(max.)

・Number of cycles : 2

(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 cm^2.
(3) The cleaning time should be kept to a minimum. Also, samples must be swang in the solvent. Please consult us.

9. Storage

Capacitors should be tightly sealed in moisture prevention bag and stored with supplied reel. 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℃/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.

These application notes are prepared based on the technical report RCR-2368B "Guideline of notabilia for fixed tantalum electrolytic capacitors with solid electrolyte foruse 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.

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 http://www.ncc-matsuo.co.jp/