Type 204

(No.P-204-E001)

Type 204 is a highly reliable epoxy resin coating tantalum solid electrolytic capacitor.

FEATURES

1. High reliability and small size.
2. Usable at operating temperature range -55 ~ +125°C.
3. Packaging(Reel and Ammo) is available for automatic insertion (up to case code 8).
4. Available for capacitance tolerance code “J”(±5%).
5. Available for Lead-free and RoHS Compliant.

RATING

Item	Description
Operating temperature	-55 to +125℃
Maximum operating temperature for DC rated voltage	+85℃ ([1])
DC rated voltage range(U_R)	See CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS
Nominal capacitance range(C_R)	
Capacitance tolerance	
Failure rate level	Type 204 M series: 1%/1000h
	Type 204 N series: 0.5%/1000h ([2])

Note[(1)]: For operation 125℃,derate voltage linearly to 67% of 85℃ voltage rating.
Note[(2)]:Failure rate level 0.5%/1000h(Code N) is available for rated voltage up to 35V,case size code 10 or less.

ORDERING INFORMATION

204 TYPE

Marking	Series
M	Failure rate level 1%/1000h
N	Failure rate level 0.5%/1000h

N SERIES

Marking	Rated voltage
3151	3.15VDC
6301	6.3VDC
1002	10VDC
1602	16VDC
2002	20VDC
2502	25VDC
3502	35VDC
5002	50VDC

1602 RATED VOLTAGE

106 CAPACITANCE

Marking	Capacitance	Marking	Capacitance
104	0.1 μF	106	10 μF
154	0.15 μF	156	15 μF
224	0.22 μF	226	22 μF
334	0.33 μF	336	33 μF
474	0.47 μF	476	47 μF
684	0.68 μF	686	68 μF
105	1.0 μF	107	100 μF
155	1.5 μF	157	150 μF
225	2.2 μF	227	220 μF
335	3.3 μF	337	330 μF
475	4.7 μF	477	470 μF
685	6.8 μF		

M CAPACITANCE TOLERANCE

Marking	Capacitance Tolerance
K	±10%
M	±20%

B STYLE OF REELED PACKAGE

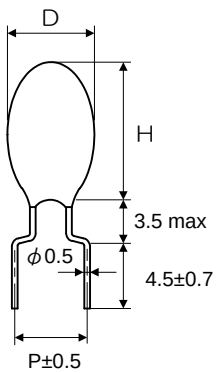
Marking	Lead style or style of packing
3	Hockey Stick
4	Straight Lead
B	Ammo Package
C	Reel Package

F COMPLIANCE WITH ROHS DIRECTIVE

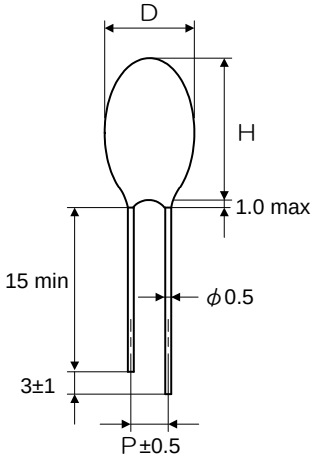
Marking	RoHS compliance
–	Not compliant
F	Compliant

DIMENSIONS

Code 3



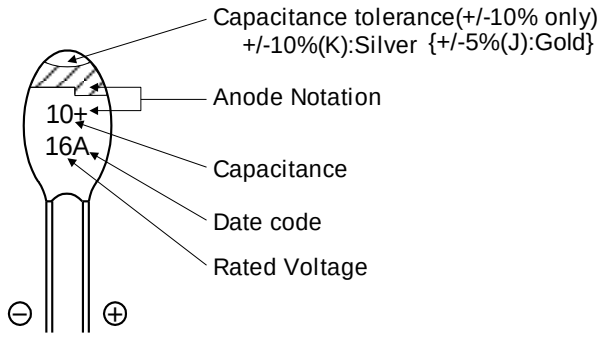
Code 4



Case code	φ D max	H max	P±0.5	
			Code 3	Code 4
1	3.6	6.5	5.0	2.5
2	3.8	7.0	5.0	2.5
3	4.0	7.5	5.0	2.5
4	4.8	8.0	5.0	2.5
5	5.0	8.5	5.0	2.5
6	5.5	9.5	5.0	2.5
7	6.0	10.0	5.0	2.5
8	6.5	11.5	5.0	2.5
9	7.5	13.0	5.0	5.0
10	8.0	14.0	5.0	5.0
11([1])	8.5	20.0	5.0	5.0

Note ([1]): Case code 11’s Dimension H includes resin coating of lead wire.

MARKING



STANDARD RATING

R.V.(VDC) / Cap.(μF)	3.15	6.3	10	16	20	25	35	50
0.1							1	2
0.15							1	2
0.22							1	2
0.33							1	2
0.47							1	2
0.68							1	2
1.0							1	3
1.5						1	2	4
2.2					1	2	3	5
3.3				1	2	3	4	6
4.7			1	2	3	4	5	7
6.8		1	2	3	4	5	6	8
10	1	2	3	4	5	6	7	9
15	2	3	4	5	6	7	8	10
22	3	4	5	6	7	8	9	11
33	4	5	6	7	8	9	10	
47	5	6	7	8	9	10	11	
68	6	7	8	9	10	11		
100	7	8	9	10	11			
150	8	9	10	11				
220	9	10	11					
330	10	11						
470	11							

CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS

March, 2011

Catalog Number (1)(2) (3)(4) (5)	U_R VDC	U_S VDC	C_R μF	Case code	Leakage current(DCL) μA			Dissipation factor			
					20℃	85℃	125℃	-55℃	20℃	85℃	125℃
204_ 1 3151 106_ 2 3 5	3.15	4	10	1	0.5	5	6.3	0.08	0.06	0.06	0.06
204_ 1 3151 156_ 2 3 5	↓	↓	15	2	0.5	5	6.3	↓	↓	↓	↓
204_ 1 3151 226_ 2 3 5			22	3	0.7	7	8.7	↓	↓	↓	↓
204_ 1 3151 336_ 2 3 5			33	4	1.0	10	13	↓	↓	↓	↓
204_ 1 3151 476_ 2 3 5			47	5	1.5	15	19	↓	↓	↓	↓
204_ 1 3151 686_ 2 3 5			68	6	2.1	21	27	↓	↓	↓	↓
204_ 1 3151 107_ 2 3 5			100	7	3.2	32	39	0.10	0.08	0.08	0.08
204_ 1 3151 157_ 2 3 5			150	8	4.7	47	59	↓	↓	↓	↓
204_ 1 3151 227_ 2 4 5			220	9	7.0	70	100	↓	↓	↓	↓
204_ 1 3151 337_ 2 4 5			330	10	10	100	130	↓	↓	↓	↓
204M 3151 477_ 2 4 5	↓	↓	470	11	15	150	185	0.12	0.10	0.10	0.10
204_ 1 6301 685_ 2 3 5	6.3	8.0	6.8	1	0.5	5	6.3	0.08	0.06	0.06	0.06
204_ 1 6301 106_ 2 3 5			10	2	0.6	6	7.9	↓	↓	↓	↓
204_ 1 6301 156_ 2 3 5			15	3	0.9	9	12	↓	↓	↓	↓
204_ 1 6301 226_ 2 3 5			22	4	1.4	14	17	↓	↓	↓	↓
204_ 1 6301 336_ 2 3 5			33	5	2.1	21	26	↓	↓	↓	↓
204_ 1 6301 476_ 2 3 5			47	6	3.0	30	37	↓	↓	↓	↓
204_ 1 6301 686_ 2 3 5			68	7	4.3	43	54	↓	↓	↓	↓
204_ 1 6301 107_ 2 3 5			100	8	6.3	63	79	0.10	0.08	0.08	0.08
204_ 1 6301 157_ 2 4 5			150	9	9.5	95	118	↓	↓	↓	↓
204_ 1 6301 227_ 2 4 5			220	10	14	140	173	↓	↓	↓	↓
204M 6301 337_ 2 4 5	↓	↓	330	11	21	210	260	↓	↓	↓	↓
204_ 1 1002 475_ 2 3 5	10	13	4.7	1	0.5	5	6.3	0.08	0.06	0.06	0.06
204_ 1 1002 685_ 2 3 5			6.8	2	0.7	7	8.5	↓	↓	↓	↓
204_ 1 1002 106_ 2 3 5			10	3	1.0	10	13	↓	↓	↓	↓
204_ 1 1002 156_ 2 3 5			15	4	1.5	15	19	↓	↓	↓	↓
204_ 1 1002 226_ 2 3 5			22	5	2.2	22	28	↓	↓	↓	↓
204_ 1 1002 336_ 2 3 5			33	6	3.3	33	41	↓	↓	↓	↓
204_ 1 1002 476_ 2 3 5			47	7	4.7	47	59	↓	↓	↓	↓
204_ 1 1002 686_ 2 3 5			68	8	6.8	68	85	↓	↓	↓	↓
204_ 1 1002 107_ 2 4 5			100	9	10	100	125	0.10	0.08	0.08	0.08
204_ 1 1002 157_ 2 4 5			150	10	15	150	188	↓	↓	↓	↓
204M 1002 227_ 2 4 5	↓	↓	220	11	22	220	275	↓	↓	↓	↓
204_ 1 1602 335_ 2 3 5	16	20	3.3	1	0.5	5	6.6	0.08	0.06	0.06	0.06
204_ 1 1602 475_ 2 3 5			4.7	2	0.8	8	9.4	↓	↓	↓	↓
204_ 1 1602 685_ 2 3 5			6.8	3	1.1	11	14	↓	↓	↓	↓
204_ 1 1602 106_ 2 3 5			10	4	1.6	16	20	↓	↓	↓	↓
204_ 1 1602 156_ 2 3 5			15	5	2.4	24	30	↓	↓	↓	↓
204_ 1 1602 226_ 2 3 5			22	6	3.5	35	44	↓	↓	↓	↓
204_ 1 1602 336_ 2 3 5			33	7	5.3	53	66	↓	↓	↓	↓
204_ 1 1602 476_ 2 3 5			47	8	7.5	75	94	↓	↓	↓	↓
204_ 1 1602 686_ 2 4 5			68	9	11	110	136	↓	↓	↓	↓
204_ 1 1602 107_ 2 4 5			100	10	16	160	200	0.10	0.08	0.08	0.08
204M 1602 157_ 2 4 5	↓	↓	150	11	24	240	300	↓	↓	↓	↓
204_ 1 2002 225_ 2 3 5	20	25	2.2	1	0.5	5	6.3	0.08	0.06	0.06	0.06
204_ 1 2002 335_ 2 3 5			3.3	2	0.7	7	8.3	↓	↓	↓	↓
204_ 1 2002 475_ 2 3 5			4.7	3	0.9	9	12	↓	↓	↓	↓
204_ 1 2002 685_ 2 3 5			6.8	4	1.4	14	17	↓	↓	↓	↓
204_ 1 2002 106_ 2 3 5			10	5	2.0	20	25	↓	↓	↓	↓
204_ 1 2002 156_ 2 3 5			15	6	3.0	30	38	↓	↓	↓	↓
204_ 1 2002 226_ 2 3 5			22	7	4.4	44	55	↓	↓	↓	↓
204_ 1 2002 336_ 2 3 5			33	8	6.6	66	83	↓	↓	↓	↓
204_ 1 2002 476_ 2 4 5			47	9	9.4	94	118	↓	↓	↓	↓
204_ 1 2002 686_ 2 4 5			68	10	14	140	170	↓	↓	↓	↓
204M 2002 107_ 2 4 5	↓	↓	100	11	20	200	250	0.10	0.08	0.08	0.08

Catalog Number ([1])([2]) ([3])([4]) ([5])	U_R VDC	U_S VDC	C_R μF	Case code	Leakage current(DCL) μA			Dissipation factor			
					20℃	85℃	125℃	-55℃	20℃	85℃	125℃
204_[1] 2502 155_[2] [3] [5]	25	32	1.5	1	0.5	5	6.3	0.08	0.06	0.06	0.06
204_[1] 2502 225_[2] [3] [5]	↓	↓	2.2	2	0.6	6	6.9	↓	↓	↓	↓
204_[1] 2502 335_[2] [3] [5]	↓	↓	3.3	3	0.8	8	10	↓	↓	↓	↓
204_[1] 2502 475_[2] [3] [5]	↓	↓	4.7	4	1.2	12	15	↓	↓	↓	↓
204_[1] 2502 685_[2] [3] [5]	↓	↓	6.8	5	1.7	17	21	↓	↓	↓	↓
204_[1] 2502 106_[2] [3] [5]	↓	↓	10	6	2.5	25	31	↓	↓	↓	↓
204_[1] 2502 156_[2] [3] [5]	↓	↓	15	7	3.8	38	47	↓	↓	↓	↓
204_[1] 2502 226_[2] [3] [5]	↓	↓	22	8	5.5	55	69	↓	↓	↓	↓
204_[1] 2502 336_[2] [4] [5]	↓	↓	33	9	8.3	83	103	↓	↓	↓	↓
204_[1] 2502 476_[2] [4] [5]	↓	↓	47	10	12	120	147	↓	↓	↓	↓
204M 2502 686_[2] [4] [5]	↓	↓	68	11	17	170	213	↓	↓	↓	↓
204_[1] 3502 104_[2] [3] [5]	35	44	0.1	1	0.5	5	6.3	0.05	0.04	0.04	0.05
204_[1] 3502 154_[2] [3] [5]	↓	↓	0.15	1	0.5	5	6.3	↓	↓	↓	↓
204_[1] 3502 224_[2] [3] [5]	↓	↓	0.22	1	0.5	5	6.3	↓	↓	↓	↓
204_[1] 3502 334_[2] [3] [5]	↓	↓	0.33	1	0.5	5	6.3	↓	↓	↓	↓
204_[1] 3502 474_[2] [3] [5]	↓	↓	0.47	1	0.5	5	6.3	↓	↓	↓	↓
204_[1] 3502 684_[2] [3] [5]	↓	↓	0.68	1	0.5	5	6.3	↓	↓	↓	↓
204_[1] 3502 105_[2] [3] [5]	↓	↓	1.0	1	0.5	5	6.3	↓	↓	↓	↓
204_[1] 3502 155_[2] [3] [5]	↓	↓	1.5	2	0.5	5	6.6	0.08	0.06	0.06	0.06
204_[1] 3502 225_[2] [3] [5]	↓	↓	2.2	3	0.8	8	9.6	↓	↓	↓	↓
204_[1] 3502 335_[2] [3] [5]	↓	↓	3.3	4	1.2	12	14	↓	↓	↓	↓
204_[1] 3502 475_[2] [3] [5]	↓	↓	4.7	5	1.6	16	21	↓	↓	↓	↓
204_[1] 3502 685_[2] [3] [5]	↓	↓	6.8	6	2.4	24	30	↓	↓	↓	↓
204_[1] 3502 106_[2] [3] [5]	↓	↓	10	7	3.5	35	44	↓	↓	↓	↓
204_[1] 3502 156_[2] [3] [5]	↓	↓	15	8	5.3	53	66	↓	↓	↓	↓
204_[1] 3502 226_[2] [4] [5]	↓	↓	22	9	7.7	77	96	↓	↓	↓	↓
204_[1] 3502 336_[2] [4] [5]	↓	↓	33	10	12	120	144	↓	↓	↓	↓
204M 3502 476_[2] [4] [5]	↓	↓	47	11	16	160	206	↓	↓	↓	↓
204M 5002 104_[2] [3] [5]	50	63	0.10	2	0.5	5	6.3	0.05	0.04	0.04	0.05
204M 5002 154_[2] [3] [5]	↓	↓	0.15	2	0.5	5	6.3	↓	↓	↓	↓
204M 5002 224_[2] [3] [5]	↓	↓	0.22	2	0.5	5	6.3	↓	↓	↓	↓
204M 5002 334_[2] [3] [5]	↓	↓	0.33	2	0.5	5	6.3	↓	↓	↓	↓
204M 5002 474_[2] [3] [5]	↓	↓	0.47	2	0.5	5	6.3	↓	↓	↓	↓
204M 5002 684_[2] [3] [5]	↓	↓	0.68	2	0.5	5	6.3	↓	↓	↓	↓
204M 5002 105_[2] [3] [5]	↓	↓	1.0	3	0.5	5	6.3	↓	↓	↓	↓
204M 5002 155_[2] [3] [5]	↓	↓	1.5	4	0.8	8	9.4	0.08	0.06	0.06	0.06
204M 5002 225_[2] [3] [5]	↓	↓	2.2	5	1.1	11	14	↓	↓	↓	↓
204M 5002 335_[2] [3] [5]	↓	↓	3.3	6	1.7	17	21	↓	↓	↓	↓
204M 5002 475_[2] [3] [5]	↓	↓	4.7	7	2.4	24	29	↓	↓	↓	↓
204M 5002 685_[2] [3] [5]	↓	↓	6.8	8	3.4	34	43	↓	↓	↓	↓
204M 5002 106_[2] [4] [5]	↓	↓	10	9	5.0	50	63	↓	↓	↓	↓
204M 5002 156_[2] [4] [5]	↓	↓	15	10	7.5	75	94	↓	↓	↓	↓
204M 5002 226_[2] [4] [5]	↓	↓	22	11	11	110	138	↓	↓	↓	↓

*U_R = Rated Voltage U_S = Suge Voltage C_R = Capacitance

Note ([1]): series code “M” or “N”.

Note ([2]): capacitance tolerance code “K” or “M”.

Note ([3]): lead style (3 or 4) or packaging style code (B or C).

Note ([4]): lead style (3 or 4)

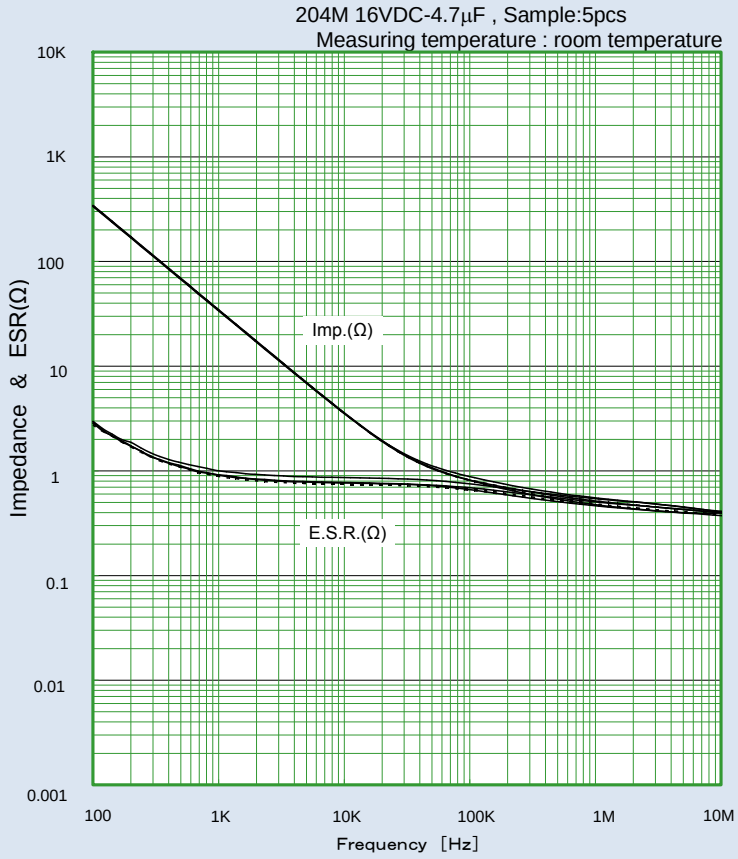
Note ([5]): for RoHS compliant, insert “F”

PERFORMANCE

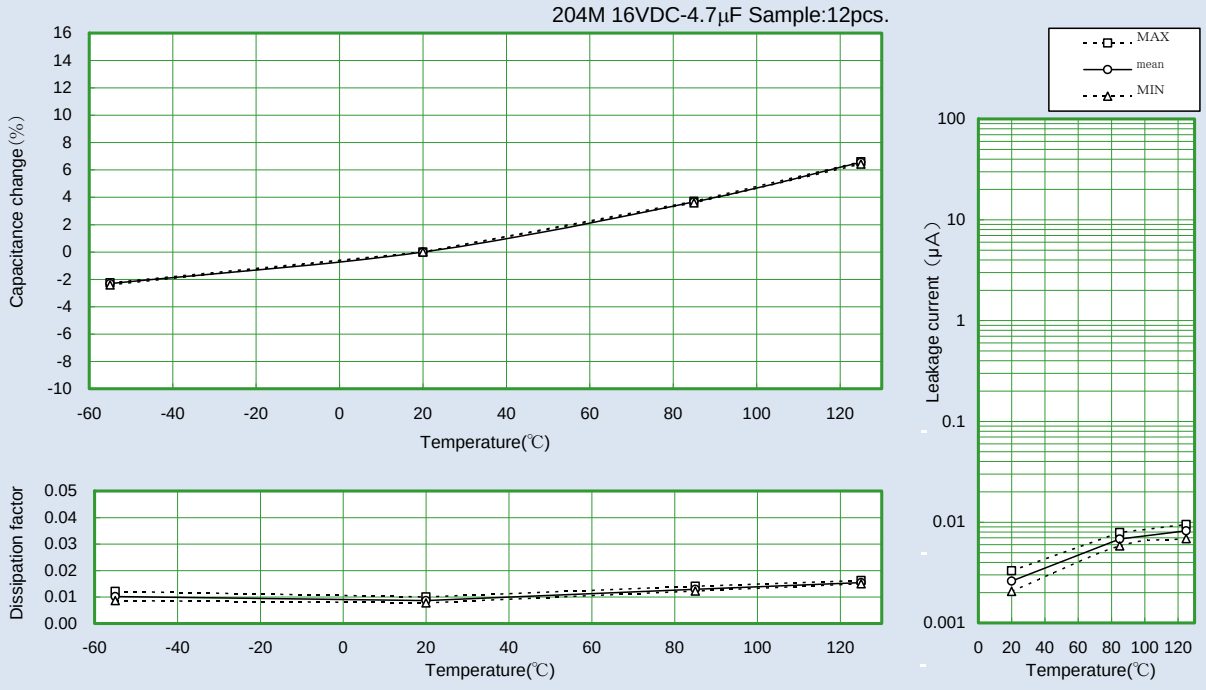
No.	Item			Performance	Test method
1	Leakage Current (μA)			Shall not exceed 0.01 CV or 0.5 whichever is greater.	JIS C 5101-1, 4.9 Applied Voltage : Rated Voltage for 5 min. Temperature : 20°C
2	Capacitance (μF)			Shall be within tolerance of the nominal value specified.	JIS C 5101-1, 4.7 Frequency : 120 Hz± 20% Voltage : 0.5Vrms+1.5 ~2VDC Temperature : 20°C
3	Dissipation Factor			Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	JIS C 5101-1, 4.8 Frequency : 120 Hz± 20% Voltage : 0.5Vrms+1.5 ~2VDC Temperature : 20°C
4	Characteristics at High and LowTemperature				JIS C 5101-1, 4.29
		Step1	Leakage Current Capacitance Dissipation Factor	Shall not exceed the value in No.1. Shall be within the specified tolerance. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	Measuring temperature : 20 ± 2°C
		Step2	Capacitance Change Dissipation Factor	Shall be within ± 10% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	Measuring temperature : -55±3 °C
		Step3	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed the value in No.1. Shall be within ± 2% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	Measuring temperature : 20 ± 2°C
		Step4	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed 0.1 CV or 5 whichever is greater. Shall be within ± 10% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	Measuring temperature : 85±2°C
		Step5	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed 0.125 CV or 6.3 whichever is greater. Shall be within ± 15% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	Measuring temperature : 125±2°C Measuring voltage : Derated voltage at 125°C
		Step6	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed the value in No.1. Shall be within ± 2% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	Measuring temperature : 20 ± 2°C
5	Surge		Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of the value at Step 1. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.26 Test temperature and applied voltage : To each half of specimens • 85 ± 2°C Applied Voltage :DC surge voltage Series protective resistance : 1000 Ω Discharge resistance : 1000 Ω
6	Terminal strength		Tensile strength	No fault such as breakage and loosening terminal	JIS C 5101-1, 4.13.1 Applied force : 5N Duration:10± 1 sec
			Bending strength	No fault such as breakage and loosening terminal	JIS C 5101-1, 4.13.2 Load : 2.5 N Bending sycle:2
7	Vibration		Capacitance Appearance	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 perpendicular directions (total 6 hours) Mounting : Solder terminal to the printed board
8	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
9	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 : 2 ± 0.5 sec Dipping depth : Terminal shall be dipped into melted solder.
10	Resistance to Soldering Heat		Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 3% of the value at Step 1. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.14 Solder temperature: 260 ± 5°C Dipping time: 10 ± 1 sec Dipping depth : Terminal shall be dipped into melted solder.

No.	Item		Performance	Test method
11	Rapid Change of Temperature	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of the value at Step 1. Shall not exceed the value in No.3. 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. max. Step 3 : 125 ± 2°C, 30 ± 3 min. Step 4 : 25 $^{+10}_{-5}$ °C, 3 min. max. Number of cycles : 5
12	Damp heat, Steady state	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of the value at Step 1. Shall not exceed 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 ~ 95%RH Duration : 500 $^{+24}_{0}$ hrs
13	Endurance	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed 125% of the value in No.1. Shall be within ± 10% of the value at Step 1. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.23 Test temperature and applied voltage : 85 ± 2°C and rated voltage or 125 ± 3°C and 2/3 × rated voltage Duration : 2000 $^{+72}_{0}$ hrs Power supply impedance : 3 Ω or less

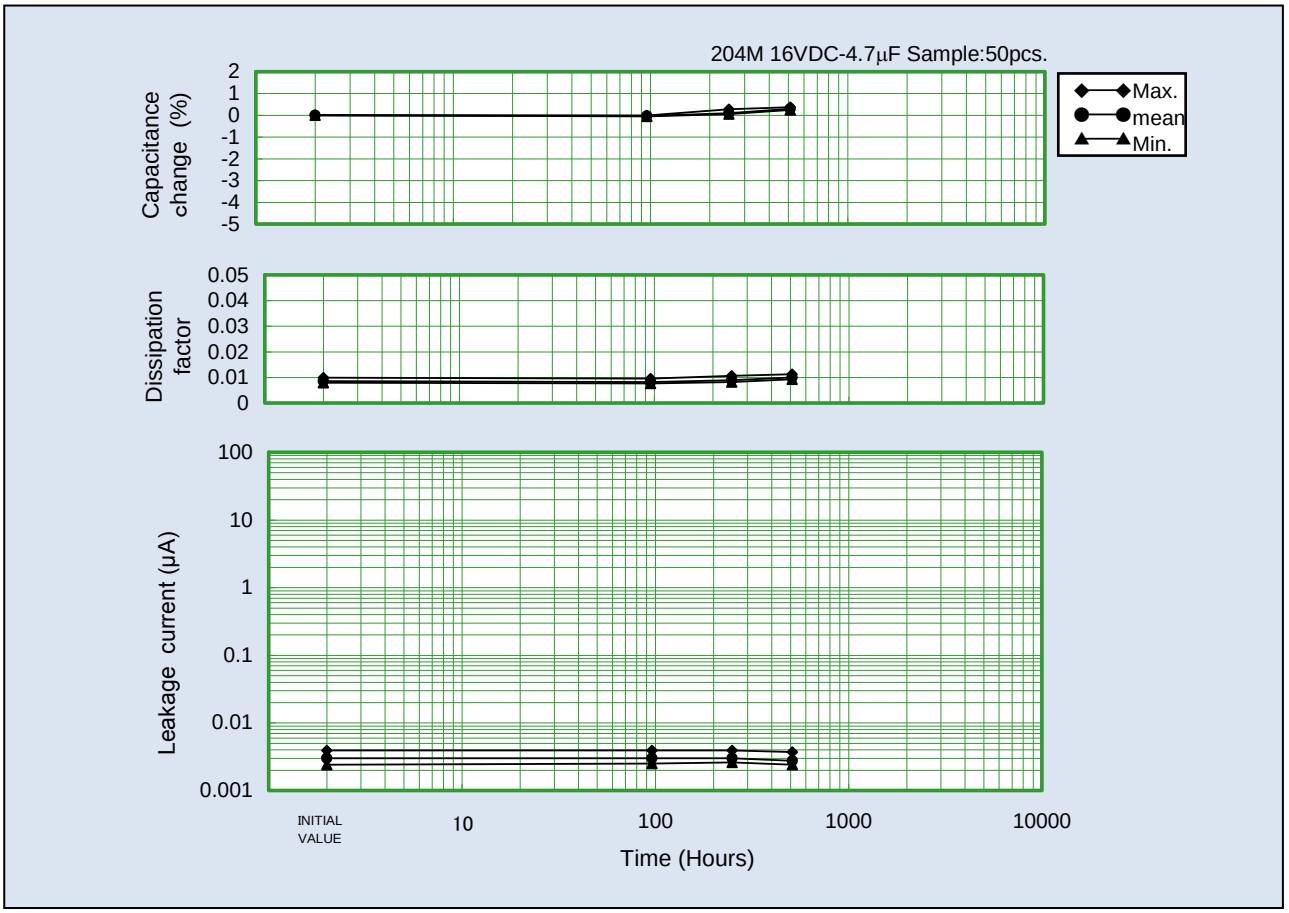
FREQUENCY CHARACTERISTICS



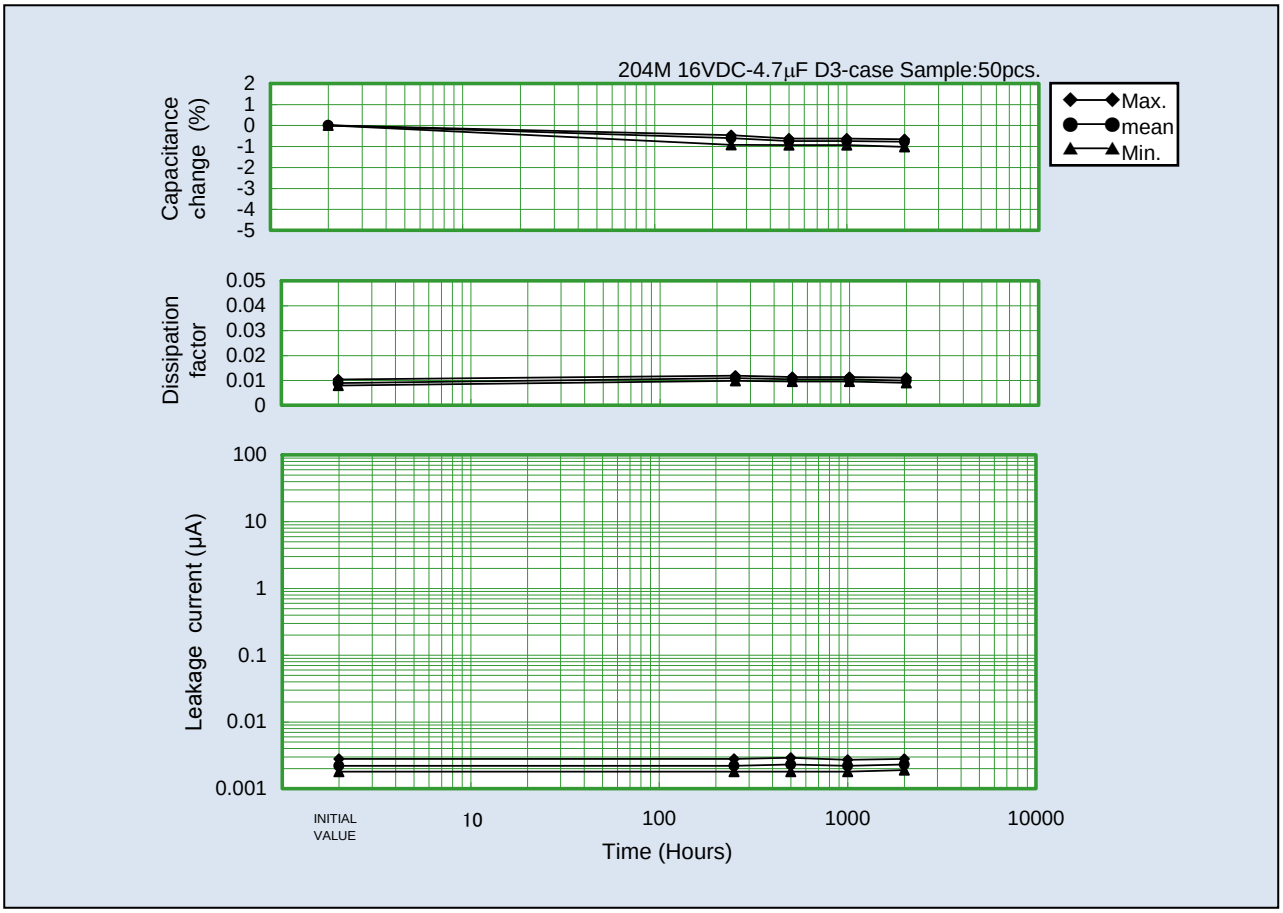
TEMPERATURE CHARACTERISTICS



DAMP HEAT, STEADY STATE 40℃, 95%RH



ENDURANCE 85℃, RATED VOLTAGE



Application Notes for Tantalum Solid Electrolytic Capacitor（Type 204）

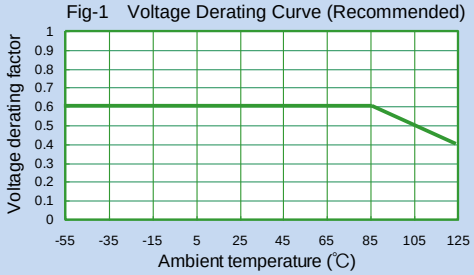
1. Operating Voltage

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 Ω series resistance is repeated 1000 times in 6-minute periods.

Rated voltage (VDC)	3.15	6.3	10	16	20	25	35	50
Surge voltage (VDC)	4	8	13	20	25	32	44	63

When designing the circuit, the equipment’s required reliability must be considered and appropriate voltage derating must be performed. Figure 1 shows the recommended voltage derating curve for Tantalum capacitors as described by NASA APPLICATION NOTES.

Fig-1 Voltage Derating Curve (Recommended)



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 Voltage

Permissible ripple voltage is determined by the heat loss of the element and heat radiation of the lead wire. This is influenced by capacitance, ESR, operating temperature, and frequency or ripple. Please consult Matsuo’s Engineering Bulletin for details on calculating ripple current values.

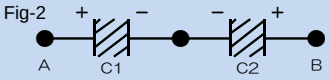
5. Application on low-impedance circuit

The failure rate of low impedance circuit at 0.1Ω/V is about five times greater than that of a 1Ω/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)

Tantalum capacitors can be used as a non-polar unit if two capacitors are connected “BACK-TO-BACK” when reserve voltage is applied at a more than permissible value, or in a purely AC circuit. The two capacitors should both be of the same rated voltage and capacitance tolerance, and they should both be twice the required capacitance value.

Fig-2

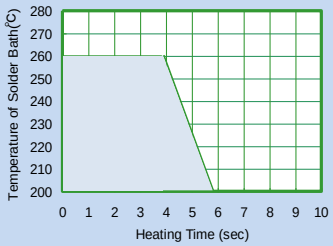


Ripple Voltage: Permissible Ripple Voltage shall not exceed the value allowed for either C1 or C2 (This will be the same, as the capacitors should be identical.)
Capacitance: (C1 × C2) / (C1 + C2)
Leakage Current: If terminal A is (+), the Leakage Current will be equal to C1’s Leakage Current.
If terminal B is (+), the Leakage Current will be equal to C2’s Leakage Current.

7. Soldering

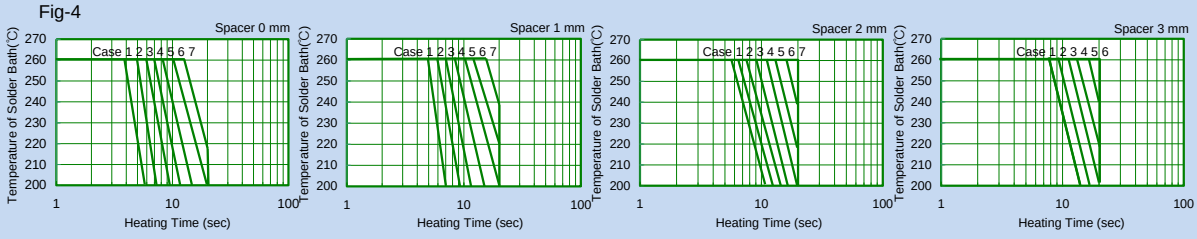
The soldering of Type 204 should be operated per the following recommended conditions.
(1) Flow Soldering
This type soldering is a way to solder parts from under the glass-epoxy PC board regarding which parts are put into hole of the board. Figure 3 shows temperature and dipping time of solder Bath.

Fig-3



Regarding floor time, if it goes beyond the condition of Figure 3, in order to control temperature raise, spacer should be attached to lead wire by Teflon, which can make products some raise from board. Figure 4 shows tolerance of temperature and dipping time on the case.

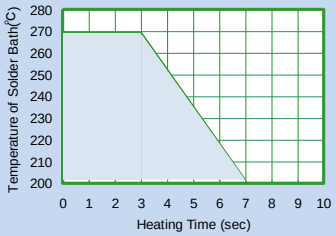
Fig-4



(2) Soldering with a Soldering Iron

It is a soldering method that parts are heated up under board by soldering iron after putting parts into through-hole of PC board such as item 7.11.Allowance is shown in Figure 5 regarding temperature and holding time of soldering iron.

Fig-5



8.Example of trouble phenomenon happening by excessive heating when soldering

When mounting, the following breakdown phenomena might be caused when excessive heating that exceeds the above-mentioned tolerance is done. Therefore, please pay attention to the operation.

In a case that solder is used for cathode connection of molding type product, Ag in silver paste could merge into solder if solder in product have melted. That might cause excessive Leakage Current and Short etc. by changing in deterioration in DF and the high frequency impedance or internal stresses in that case.

Mechanical stress according to heat stress and expansion shrinkage or concentrations of internal stress might increase failure rate.

9.Flux

Please use flux as much as possible with non-acidity and little content of both chlorine and amine.

10. 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.

11. 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.

12. 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.

13. 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 Industrial Waste since they contain various metals and polymers.
· Capacitors submitted as samples should not be used for production purposes.

These application notes are prepared based on "Guideline of notabilia for fixed tantalum electrolytic capacitors with solid electrolyte for use in electronic equipment" (EIAJ 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.

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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/		