Type 267 M Series

Type 267 is specially designed to SMD, based on our technology of chip tantalum capacitors acquired over many years. Fully-molded construction provides excellent mechanical protection, superior moisture resistance and high soldering heat resistance.

FEATURES

1. Suitable for surface mounting.
2. Dimensional accuracy and symmetrical terminal structure suitable for high-density mounting ensures excellent "Self-Alignment".
3. Soldering: 260℃ for 10 seconds by re-flow soldering.
4. Lead-free and RoHS Compliant

RATING

Item	Rating
Category temperature range (Operating temperature)	-55 ~ +125°C
Rated Temperature (Maximum operating temperature for DC rated Voltage)	+85°C
DC rated voltage range［U_R］	See CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS
Rated capacitance (Normal capacitance range［C_R］)	
Rated capacitance tolerance	
Failure rate level	1%/1000 h

Note(1): For operation 125℃,derate voltage linearly to 67% of 85℃ voltage rating.

ORDERING INFORMATION

267	M	3502	104	M	R
TYPE	SERIES	RATED VOLTAGE	CAPACITANCE	CAPACITANCE TOLERANCE	STYLE OF REELED PACKAGE

Marking	Rated voltage
4001	4DVC
6301	6.3DVC
1002	10VDC
1602	16VDC
2002	20VDC
2502	25VDC
3502	35VDC
5002	50VDC

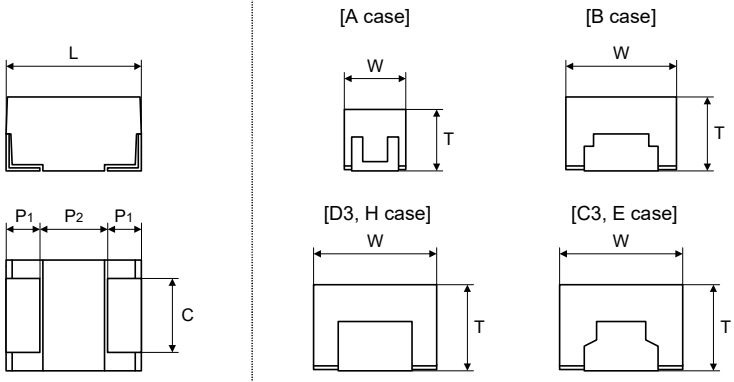
Marking	Capacitance	Marking	Capacitance
473	0.047 μF	475	4.7 μF
104	0.1 μF	685	6.8 μF
154	0.15 μF	106	10 μF
224	0.22 μF	156	15 μF
334	0.33 μF	226	22 μF
474	0.47 μF	336	33 μF
684	0.68 μF	476	47 μF
105	1.0 μF	686	68 μF
155	1.5 μF	107	100 μF
225	2.2 μF	157	150 μF
335	3.3 μF	227	220 μF

Marking	Capacitance Tolerance
K	±10%
M	±20%

（Taping specification）

Code	Reel Size	Anode Notation
R	φ180 Reel	Feed hole: -
L	φ180 Reel	Feed hole: +
N	φ330 Reel	Feed hole: -
P	φ330 Reel	Feed hole: +

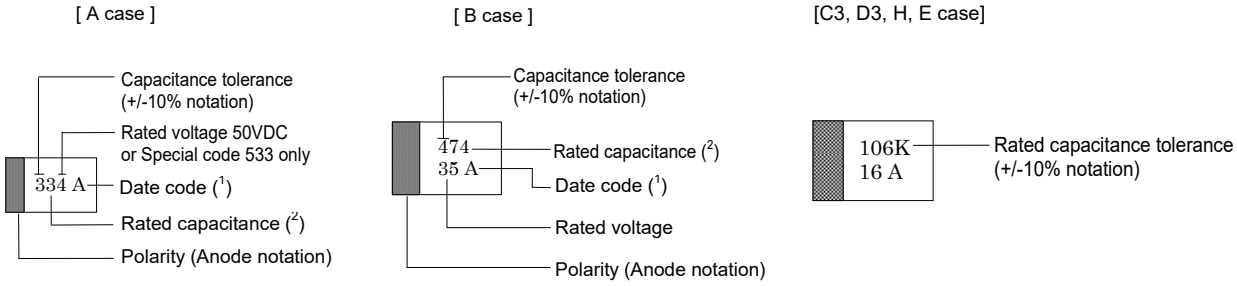
DIMENSIONS



(mm)

Case Code	EIA Code	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
C3	6032	6.0	3.2	2.5	1.3	3.0	2.2
D3	7343	7.3	4.4	2.8	1.3	4.0	2.4
H	7343H	7.3	4.4	4.1	1.3	4.0	2.4
E	7257	7.3	5.8	3.5	1.3	4.0	3.5

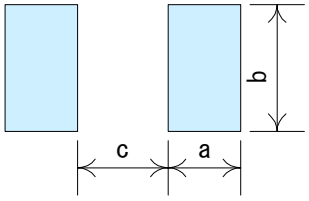
MARKING



Note(1) Date codes are based on the Annex 1 Table 13 of JIS C 5101-1.

Note(2) First two digits are significant figures of capacitance value(pF).Third digit is the number of zeros following.

RECOMMENDED SOLDER PAD LAYOUT



(mm)

Case Code	EIA Code	a		b	c
		Flow	Reflow		
A	3216	3.0	2.0	1.5	1.5
B	3528	3.2	2.0	2.4	1.8
C3	6032	4.2	2.4	2.5	3.3
D3	7343	5.2	2.4	2.7	4.6
E	7257	5.6	2.4	3.8	4.6
H	7343H	5.2	2.4	2.7	4.6

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

STANDARD RATING

R.V.(VDC) / Cap.(μF)	4	6.3	10	16	20	25	35	50
0.047								A
0.068								
0.1							A	A
0.15							A	A, B
0.22							A	B
0.33							A	B
0.47						A	A, B	B, C3
0.68					A	A	B	C3
1.0				A	A		B	C3
1.5			A	A		B	B, C3	C3, D3
2.2		A	A		B	B	C3	D3
3.3	A	A		B	B	C3	C3, D3	D3
4.7	A		B	B	C3	C3	C3, D3	
6.8		B	B	C3	C3	C3, D3	D3	
10	B	B	C3	C3	C3	D3	D3, E	
15	B	C3	C3	C3	D3	D3	E	
22	C3	C3	C3	D3	D3	E	H	
33	C3	C3	D3	D3	E	H		
47	C3	D3	D3	E	E			
68	D3	D3	E	H, E				
100	D3	H, E	E					
150	E	E						
220	E							

CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS

May, 2014

Catalog Number ([1])([2])	U_R VDC	U_S VDC		C_R μF	Case code	Leakage current(DCL) μA			Dissipation factor				ESR Ω	
		85℃	125℃			20℃	85℃	125℃	-55℃	20℃	85℃	125℃	10kHz	100kHz
267M 4001 335 _ _ [1] [2]	4	5	3.2	3.3	A	0.5	5	6.3	0.08	0.06	0.06	0.06	4.0	3.6
267M 4001 475 _ _ [1] [2] 533	↓	↓	↓	4.7	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 4001 106 _ _ [1] [2]	↓	↓	↓	10	B	0.5	5	6.3	↓	↓	↓	↓	2.0	1.8
267M 4001 156 _ _ [1] [2] 533	↓	↓	↓	15	B	0.6	6	7.5	↓	↓	↓	↓	↓	↓
267M 4001 226 _ _ [1] [2] 720	↓	↓	↓	22	C3	0.9	9	11	↓	↓	↓	↓	0.6	0.55
267M 4001 336 _ _ [1] [2] 720	↓	↓	↓	33	C3	1.3	13	17	↓	↓	↓	↓	↓	↓
267M 4001 476 _ _ [1] [2] 720	↓	↓	↓	47	C3	1.9	19	24	↓	↓	↓	↓	↓	↓
267M 4001 686 _ _ [1] [2] 720	↓	↓	↓	68	D3	2.7	27	34	↓	↓	↓	↓	0.5	0.45
267M 4001 107 _ _ [1] [2] 720	↓	↓	↓	100	D3	4.0	40	50	↓	↓	↓	↓	↓	0.45
267M 4001 157 _ _ [1] [2] 720	↓	↓	↓	150	E	6.0	60	75	↓	↓	↓	↓	0.3	0.28
267M 4001 227 _ _ [1] [2] 720	↓	↓	↓	220	E	8.8	88	110	↓	↓	↓	↓	↓	0.27
267M 6301 225 _ _ [1] [2]	6.3	8	5	2.2	A	0.5	5	6.3	0.08	0.06	0.06	0.06	4.0	3.6
267M 6301 335 _ _ [1] [2] 533	↓	↓	↓	3.3	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 6301 685 _ _ [1] [2]	↓	↓	↓	6.8	B	0.5	5	6.3	↓	↓	↓	↓	2.0	1.8
267M 6301 106 _ _ [1] [2] 533	↓	↓	↓	10	B	0.6	6	7.9	↓	↓	↓	↓	↓	↓
267M 6301 156 _ _ [1] [2] 720	↓	↓	↓	15	C3	0.9	9	12	↓	↓	↓	↓	1.0	0.9
267M 6301 226 _ _ [1] [2] 720	↓	↓	↓	22	C3	1.4	14	17	↓	↓	↓	↓	0.6	0.55
267M 6301 336 _ _ [1] [2] 720	↓	↓	↓	33	C3	2.1	21	26	↓	↓	↓	↓	↓	↓
267M 6301 476 _ _ [1] [2] 720	↓	↓	↓	47	D3	3.0	30	37	↓	↓	↓	↓	0.5	0.45
267M 6301 686 _ _ [1] [2] 720	↓	↓	↓	68	D3	4.3	43	54	↓	↓	↓	↓	↓	0.45
267M 6301 107 _ _ [1] [2] 720	↓	↓	↓	100	E	6.3	63	79	0.10	0.08	0.08	0.08	0.3	0.28
267M 6301 107 _ _ [1] [2]	↓	↓	↓	100	H	6.3	63	79	↓	↓	↓	↓	0.5	0.45
267M 6301 157 _ _ [1] [2] 720	↓	↓	↓	150	E	9.5	95	118	↓	↓	↓	↓	0.3	0.27
267M 1002 155 _ _ [1] [2]	10	13	8	1.5	A	0.5	5	6.3	0.08	0.06	0.06	0.06	4.0	3.6
267M 1002 225 _ _ [1] [2] 533	↓	↓	↓	2.2	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 1002 475 _ _ [1] [2]	↓	↓	↓	4.7	B	0.5	5	6.3	↓	↓	↓	↓	2.0	1.8
267M 1002 685 _ _ [1] [2] 533	↓	↓	↓	6.8	B	0.7	7	8.5	↓	↓	↓	↓	↓	↓
267M 1002 106 _ _ [1] [2] 720	↓	↓	↓	10	C3	1.0	10	13	↓	↓	↓	↓	1.0	0.9
267M 1002 156 _ _ [1] [2] 720	↓	↓	↓	15	C3	1.5	15	19	↓	↓	↓	↓	1.0	0.9
267M 1002 226 _ _ [1] [2] 720	↓	↓	↓	22	C3	2.2	22	28	↓	↓	↓	↓	0.6	0.55
267M 1002 336 _ _ [1] [2] 720	↓	↓	↓	33	D3	3.3	33	41	↓	↓	↓	↓	1.0	0.9

Catalog Number ([1])([2])	U_R VDC	U_S VDC		C_R μF	Case code	Leakage current(DCL) μA			Dissipation factor				ESR Ω	
		85℃	125℃			20℃	85℃	125℃	-55℃	20℃	85℃	125℃	10kHz	100kHz
267M 1002 476 _[1]_[2] 720	↓	↓	↓	47	D3	4.7	47	59	↓	↓	↓	↓	0.5	0.47
267M 1002 686 _[1]_[2] 720	↓	↓	↓	68	E	6.8	68	85	↓	↓	↓	↓	0.4	0.38
267M 1002 107 _[1]_[2] 720	↓	↓	↓	100	E	10	100	125	0.10	0.08	0.08	0.08	0.3	0.27
267M 1602 105 _[1]_[2]	16	20	13	1	A	0.5	5	6.3	0.05	0.04	0.04	0.05	4.0	3.6
267M 1602 155 _[1]_[2] 533	↓	↓	↓	1.5	A	0.5	5	6.3	0.08	0.06	0.06	0.06	↓	↓
267M 1602 335 _[1]_[2]	↓	↓	↓	3.3	B	0.5	5	6.3	↓	↓	↓	↓	2.2	2.0
267M 1602 475 _[1]_[2] 533	↓	↓	↓	4.7	B	0.8	8	9.4	↓	↓	↓	↓	↓	↓
267M 1602 685 _[1]_[2] 720	↓	↓	↓	6.8	C3	1.1	11	14	↓	↓	↓	↓	1.0	0.9
267M 1602 106 _[1]_[2] 720	↓	↓	↓	10	C3	1.6	16	20	↓	↓	↓	↓	1.0	0.9
267M 1602 156 _[1]_[2] 720	↓	↓	↓	15	C3	2.4	24	30	↓	↓	↓	↓	1.0	0.9
267M 1602 226 _[1]_[2] 720	↓	↓	↓	22	D3	3.5	35	44	↓	↓	↓	↓	0.8	0.7
267M 1602 336 _[1]_[2] 720	↓	↓	↓	33	D3	5.3	53	66	↓	↓	↓	↓	0.8	0.7
267M 1602 476 _[1]_[2] 720	↓	↓	↓	47	E	7.5	75	94	↓	↓	↓	↓	0.4	0.38
267M 1602 686 _[1]_[2]	↓	↓	↓	68	H	11	110	136	↓	↓	↓	↓	↓	0.36
267M 1602 686 _[1]_[2] 720	↓	↓	↓	68	E	11	109	136	↓	↓	↓	0.08	0.3	0.27
267M 2002 684 _[1]_[2]	20	26	16	0.68	A	0.5	5	6.3	0.05	0.04	0.04	0.05	5.0	4.5
267M 2002 105 _[1]_[2] 533	↓	↓	↓	1	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 2002 225 _[1]_[2]	↓	↓	↓	2.2	B	0.5	5	6.3	0.08	0.06	0.06	0.06	3.0	2.7
267M 2002 335 _[1]_[2] 533	↓	↓	↓	3.3	B	0.7	7	8.3	↓	↓	↓	↓	↓	↓
267M 2002 475 _[1]_[2] 720	↓	↓	↓	4.7	C3	0.9	9	12	↓	↓	↓	↓	1.0	0.9
267M 2002 685 _[1]_[2] 720	↓	↓	↓	6.8	C3	1.4	14	17	↓	↓	↓	↓	1.0	0.9
267M 2002 106 _[1]_[2] 720	↓	↓	↓	10	C3	2.0	20	25	↓	↓	↓	↓	1.0	0.9
267M 2002 156 _[1]_[2] 720	↓	↓	↓	15	D3	3.0	30	38	↓	↓	↓	↓	0.8	0.72
267M 2002 226 _[1]_[2] 720	↓	↓	↓	22	D3	4.4	44	55	↓	↓	↓	↓	0.8	0.72
267M 2002 336 _[1]_[2] 720	↓	↓	↓	33	E	6.6	66	83	↓	↓	↓	↓	0.4	0.38
267M 2002 476 _[1]_[2] 720	↓	↓	↓	47	E	9.4	94	118	↓	↓	↓	0.08	0.3	0.27
267M 2502 474 _[1]_[2]	25	32	20	0.47	A	0.5	5	6.3	0.05	0.04	0.04	0.05	5.0	4.5
267M 2502 684 _[1]_[2] 533	↓	↓	↓	0.68	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 2502 155 _[1]_[2]	↓	↓	↓	1.5	B	0.5	5	6.3	0.08	0.06	0.06	0.06	3.0	2.7
267M 2502 225 _[1]_[2] 533	↓	↓	↓	2.2	B	0.6	6	6.9	↓	↓	↓	↓	↓	↓
267M 2502 335 _[1]_[2] 720	↓	↓	↓	3.3	C3	0.8	8	10	↓	↓	↓	↓	1.2	1.18
267M 2502 475 _[1]_[2] 720	↓	↓	↓	4.7	C3	1.2	12	15	↓	↓	↓	↓	↓	↓
267M 2502 685 _[1]_[2] 734	↓	↓	↓	6.8	C3	1.7	17	21	↓	↓	↓	↓	↓	1.17
267M 2502 685 _[1]_[2] 720	↓	↓	↓	6.8	D3	1.7	17	21	↓	↓	↓	↓	0.8	0.72
267M 2502 106 _[1]_[2] 720	↓	↓	↓	10	D3	2.5	25	31	↓	↓	↓	↓	0.8	0.72
267M 2502 156 _[1]_[2] 734	↓	↓	↓	15	D3	3.8	38	47	↓	↓	↓	↓	0.8	0.72
267M 2502 226 _[1]_[2] 720	↓	↓	↓	22	E	5.5	55	69	↓	↓	↓	↓	0.4	0.39
267M 2502 336 _[1]_[2]	↓	↓	↓	33	H	8.3	83	103	↓	↓	↓	↓	0.7	0.63
267M 3502 104 _[1]_[2]	35	44	28	0.1	A	0.5	5	6.3	0.05	0.04	0.04	0.05	10.0	9.0
267M 3502 154 _[1]_[2]	↓	↓	↓	0.15	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 3502 224 _[1]_[2]	↓	↓	↓	0.22	A	0.5	5	6.3	↓	↓	↓	↓	5.0	4.5
267M 3502 334 _[1]_[2]	↓	↓	↓	0.33	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 3502 474 _[1]_[2] 533	↓	↓	↓	0.47	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 3502 474 _[1]_[2]	↓	↓	↓	0.47	B	0.5	5	6.3	↓	↓	↓	↓	3.0	2.7
267M 3502 684 _[1]_[2]	↓	↓	↓	0.68	B	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 3502 105 _[1]_[2]	↓	↓	↓	1	B	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 3502 155 _[1]_[2] 533	↓	↓	↓	1.5	B	0.5	5	6.6	0.08	0.06	0.06	0.06	↓	↓
267M 3502 155 _[1]_[2] 720	↓	↓	↓	1.5	C3	0.5	5	6.6	↓	↓	↓	↓	1.2	1.18
267M 3502 225 _[1]_[2] 720	↓	↓	↓	2.2	C3	0.8	8	9.6	↓	↓	↓	↓	↓	↓
267M 3502 335 _[1]_[2] 734	↓	↓	↓	3.3	C3	1.2	12	14	↓	↓	↓	↓	↓	↓
267M 3502 335 _[1]_[2] 720	↓	↓	↓	3.3	D3	1.2	12	14	↓	↓	↓	↓	0.9	0.81
267M 3502 475 _[1]_[2] 734	↓	↓	↓	4.7	C3	1.6	16	21	↓	↓	↓	↓	1.2	1.17
267M 3502 475 _[1]_[2] 720	↓	↓	↓	4.7	D3	1.6	16	21	↓	↓	↓	↓	0.9	0.81
267M 3502 685 _[1]_[2] 720	↓	↓	↓	6.8	D3	2.4	24	30	↓	↓	↓	↓	0.9	0.81
267M 3502 106 _[1]_[2] 734	↓	↓	↓	10	D3	3.5	35	44	↓	↓	↓	↓	0.9	0.81
267M 3502 106 _[1]_[2] 720	↓	↓	↓	10	E	3.5	35	44	↓	↓	↓	↓	0.4	0.38
267M 3502 156 _[1]_[2] 720	↓	↓	↓	15	E	5.3	55	66	↓	↓	↓	↓	↓	0.39
267M 3502 226 _[1]_[2]	↓	↓	↓	22	H	7.7	77	96	↓	↓	↓	↓	0.7	0.63
267M 5002 473 _[1]_[2]	50	63	40	0.05	A	0.5	5	6.3	0.05	0.04	0.04	0.05	12.0	12.0
267M 5002 104 _[1]_[2]	↓	↓	↓	0.1	A	0.5	5	6.3	↓	↓	↓	↓	10.0	9.0
267M 5002 154 _[1]_[2] 533	↓	↓	↓	0.15	A	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 5002 154 _[1]_[2]	↓	↓	↓	0.15	B	0.5	5	6.3	↓	↓	↓	↓	5.0	4.5
267M 5002 224 _[1]_[2]	↓	↓	↓	0.22	B	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 5002 334 _[1]_[2]	↓	↓	↓	0.33	B	0.5	5	6.3	↓	↓	↓	↓	3.0	2.7
267M 5002 474 _[1]_[2] 533	↓	↓	↓	0.47	B	0.5	5	6.3	↓	↓	↓	↓	↓	↓
267M 5002 474 _[1]_[2] 720	↓	↓	↓	0.47	C3	0.5	5	6.3	↓	↓	↓	↓	↓	2.7
267M 5002 684 _[1]_[2] 720	↓	↓	↓	0.68	C3	0.5	5	6.3	↓	↓	↓	↓	↓	2.7
267M 5002 105 _[1]_[2] 720	↓	↓	↓	1	C3	0.5	5	6.3	↓	↓	↓	↓	↓	2.7
267M 5002 155 _[1]_[2] 734	↓	↓	↓	1.5	C3	0.8	8	9.4	0.08	0.06	0.06	0.06	1.2	1.2
267M 5002 155 _[1]_[2] 720	↓	↓	↓	1.5	D3	0.8	8	9.4	↓	↓	↓	↓	1.0	0.9
267M 5002 225 _[1]_[2] 720	↓	↓	↓	2.2	D3	1.1	11	14	↓	↓	↓	↓	1.0	0.9
267M 5002 335 _[1]_[2] 734	↓	↓	↓	3.3	D3	1.7	17	21	↓	↓	↓	↓	0.9	0.81

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

Note1 : For Capacitance Tolerance , insert “K” or “M” into _[1]

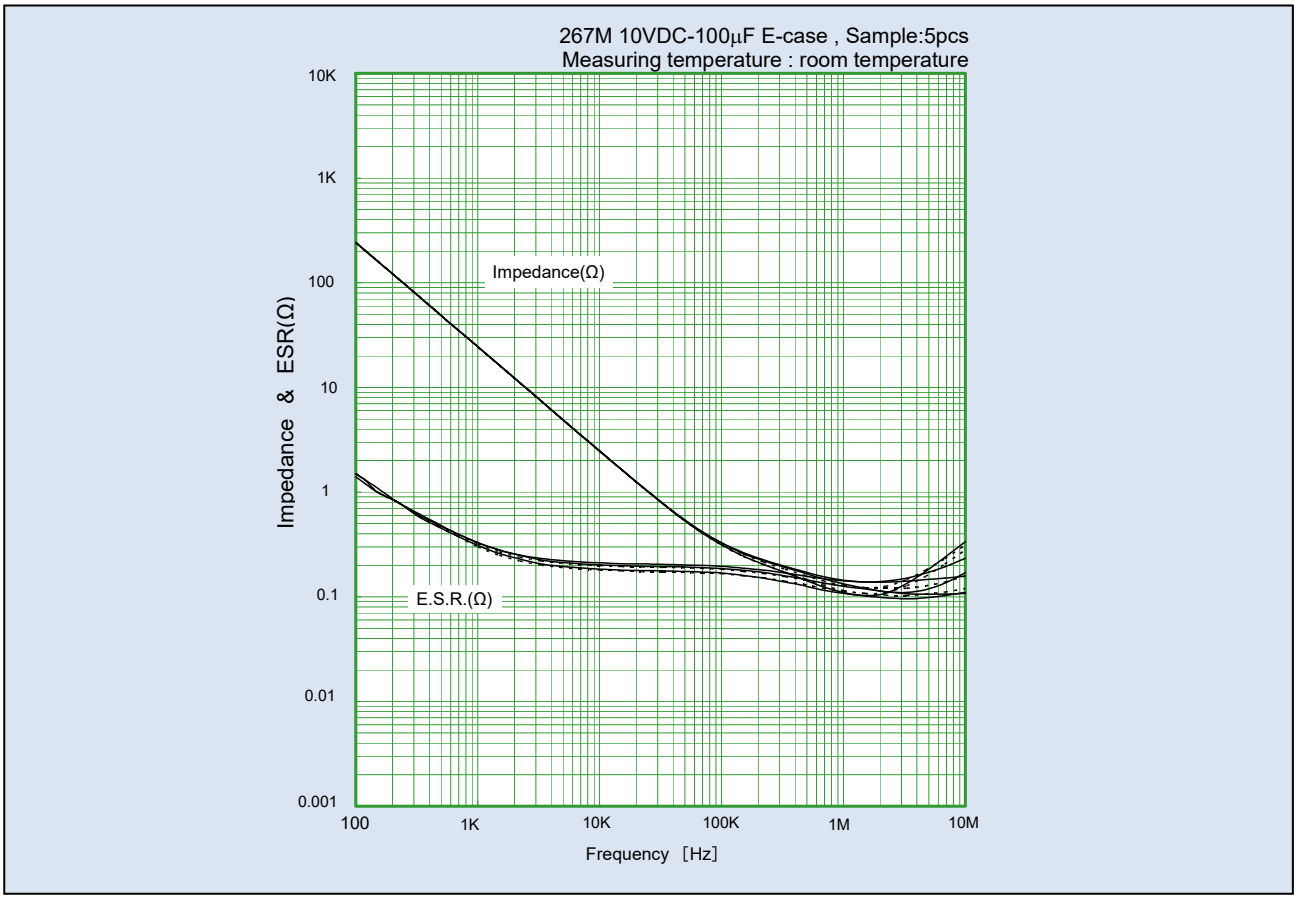
Note2 : For Reeled Package , insert “R” , “L” , “P” or “N” into _[2]

PERFORMANCE

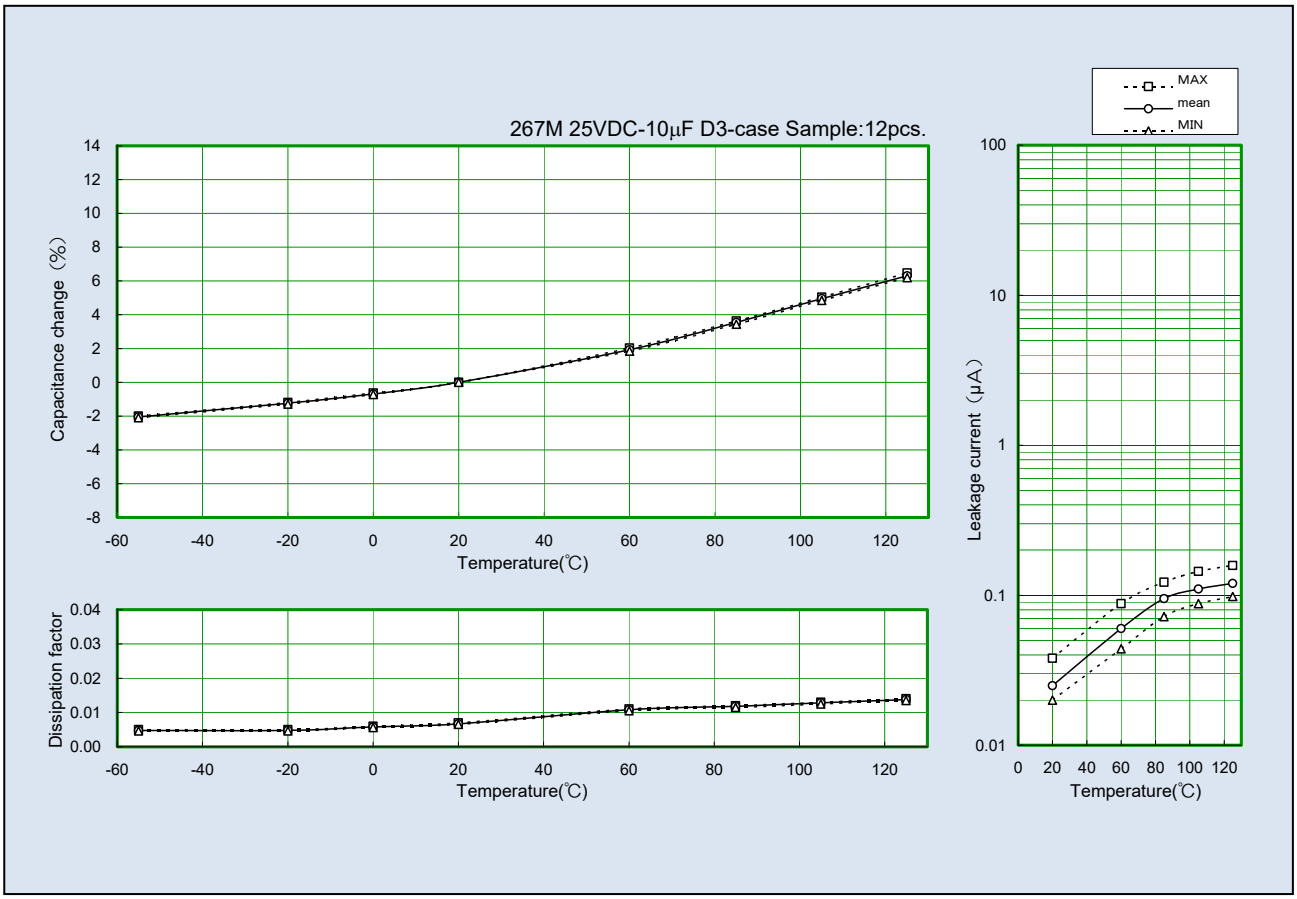
No.	Item		Performance	Test method
1	Leakage Current (μA)		Shall not exceed 0.01 CV or 0.5 whichever is greater.	JIS C 5101-1, 4.9 Applied Voltage : Rated Voltage for 5 min. Temperature : 20°C
2	Capacitance (μF)		Shall be within tolerance of the nominal value specified.	JIS C 5101-1, 4.7 Frequency : 120 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	ESR (Equivalent series resistance)		Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS.	Frequency : 10 kHz or 100kHz Temperature : 20°C
5	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
6	Surge	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of initial value. 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, · 125 ± 2°C Applied Voltage :DC surge voltage Series protective resistance : 1000 Ω Discharge resistance : 1000 Ω
7	Shear Test		No exfoliation between lead terminal and board.	JIS C 5101-1, 4.34 Capacitors mounted under conditions JIS C 5101-1, 4.33 are used as specimens. ・Soldering : Indirect heating ・Temperature : 240 ± 10°C ・Duration : 10s or less Applied pressure : 5N Duration : 10 ± 1 s
8	Substrate Bending Test	Capacitance Appearance	Initial value to remain steady during measurement. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.35 Bending : 3 mm Duration:5s
9	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

No.	Item		Performance	Test method
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 s Dipping depth : Terminal shall be dipped into melted solder.
12	Resistance to Soldering Heat	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 3% of initial value. For 6.3V-100μF (H) only within ±5% of initial value. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.14 One of the following methods (a) Complete dipping method Solder temperature: 260 ± 5°C Dipping time: 10 ± 1 s (b) Terminal dipping method Solder temperature: 260 ± 5°C Dipping time: 10 ± 1 s
13	Component solvent resistance	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed the value in No.1. Shall be within ± 3% of initial value. 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 1 Solvent : 2-propanol (Isopropyl alcohol) Rubbing material : cotton wool
15	Rapid Change of Temperature	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of initial value. 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
16	Damp heat, Steady state	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of initial value. 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 $^{+24}_{0}$ h
17	Endurance	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed 125% of the value in No.1. Shall be within ± 10% of initial value. 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 $^{+72}_{0}$ h Power supply impedance : 3 Ω or less

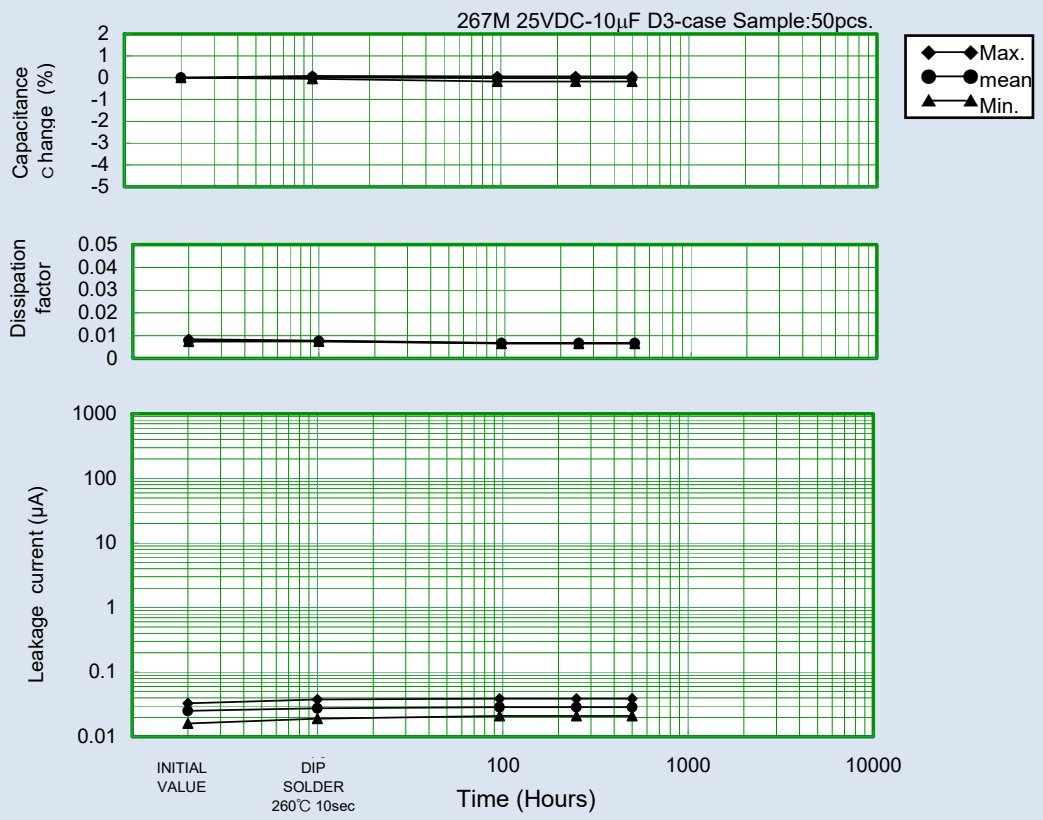
FREQUENCY CHARACTERISTICS



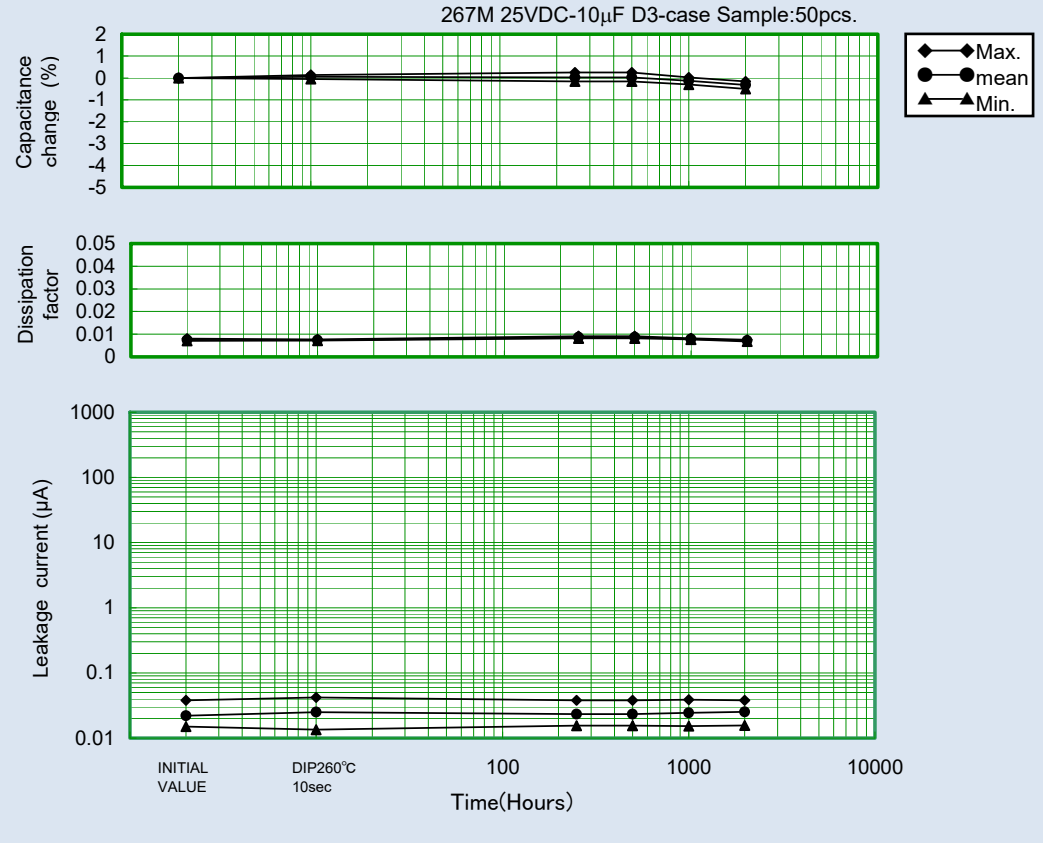
TEMPERATURE CHARACTERISTICS



DAMP HEAT, STEADY STATE 40℃, 95%RH



ENDURANCE 85℃, RATED VOLTAGE



Application Notes for Tantalum Solid Electrolytic Capacitor

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.
When designing the circuit, the equipment’s required reliability must be considered and appropriate voltage derating must be performed.

2. Application that contain AC Voltage

Special attention to the following 3 items.
(1) The sum of the DC bias voltage and the positive peak value of the AC voltage should not exceed the rated voltage.
(2) Reverse voltage should not exceed the allowable values of the negative peak AC voltage.
(3) Ripple current should not exceed the allowable values.

3. Reverse Voltage

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

4. Permissible Ripple Current

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

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

Permissible ripple current $Imax=\sqrt{\dfrac{P\max}{ESR}}$ $(Arms)$

Permissible ripple voltage $Emax=\sqrt{\dfrac{P\,max}{ESR}} \times Z$

$= Imax \times Z\ (Vrms)$

Imax : 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

Case size	Pmax（W）
A	0.045
B	0.050
C3	0.065
D3	0.085
H	0.100
E	0.105

Table 2 Pmax multiplier at each operating temperature

Operating temperature (℃)	Multiplier
25	1.0
55	0.9
85	0.8
125	0.4

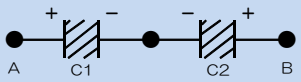
Note: Above values are measured at 0.8t glass epoxy board mounting in free air and may be changed depending on the kind of board, packing density, and air convection condition. Please consult us if calculated power loss value is different from above list of P max value.

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.



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

7.1. Preheating

To obtain optimal reliability and solderability conditions, capacitors should be pre-heated at 130 to 200 °C for approximately 60 to 120 seconds.

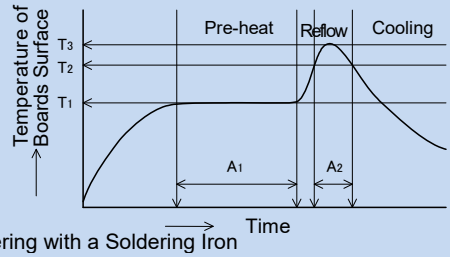
7.2. Soldering

The body of the capacitor shall not exceed 260 °C during soldering.
(1) Reflow Soldering
Reflow soldering is a process in which the capacitors are mounted on a printed board with solder paste. There are two methods of Reflow Soldering: Direct and Atmospheric Heat.
· Direct Heat (Hot plate)
During the Direct Heat method, the capacitor has been positioned on a printed board, which is then placed upon a hot plate. The capacitor maintains a lower temperature than the substrate, which in turn stays at a lower temperature than the hot plate.
· Atmospheric Heat

a) VPS (Vapor Phase Soldering)
During VPS,the substrate is heated by an inert liquid with a high boiling point. The temperature of the capacitor's body and the temperature of the substrate are about the same as the atmosphere. This temperature should be below 240°C.

b) Near and Far IR Ray
Due to the heat absorption of the capacitor's body, the internal temperature of the capacitors may be 20 ~ 30°C higher than the setting temperature and may exceed 260°C.
Temperature control is crucial in maintaining a temperature of 260 °C or lower.

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



Temperature	Time
T1=130℃～200℃	A1= 60～120sec.
T2=220℃～230℃	A2＜60sec.
T3=～260℃	10 sec. or less than 10

Number of times：2 times max..

(2) Soldering with a Soldering Iron
Soldering with a soldering iron cannot be recommended due to the lack of consistency in maintaining temperatures and process times. If this method should be necessary, the iron should never touch the capacitor's terminals, and the temperature of the soldering iron should never exceed 350°C. The application of the iron should not exceed 5 seconds.
(3) Please consult us for other methods.

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

9. Protective Resin Coating
After components are assembled to substrate, a protective resin coating is sometimes applied. As this resin coating cures, it gives mechanical and thermal stress to Tantalum capacitors. This stress can cause damage to the capacitors, which affects their reliability. Before using a resin coating, proper research must be done in regards to the material and process to insure that excessive stress will not be applied to capacitors and other components.

10. Vibration
Approximately 300 G shall be applied to a capacitor, when dropped from 1 meter to a concrete floor.
Although capacitors are made to withstand this drop test, stress from shock due to falling or striking does cause damage to the capacitors and increases failure rates. Do not subject capacitors to this type of mechanical stress.

11. Ultrasonic cleaning
Matsuo does not recommend Ultrasonic cleaning. This may cause damage to the capacitors, and may even cause broken terminals. If the Ultrasonic cleaning process will be used, please note the following:
(1)The solvent should not be boiled. (Lower the ultrasonic wave output or use solvent with The high boiling point.)
(2)The recommended wattage is less than 0.5 watts per cm^2.
(3)The cleaning time should be kept to a minimum. Also, samples must be swang in the solvlent. Please consult us.

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

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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