Tantalum Chip Capacitors

ISO 9002 CERTIFIED

Type TMC: *Standard Capacitance Range*

1. Scope of Application

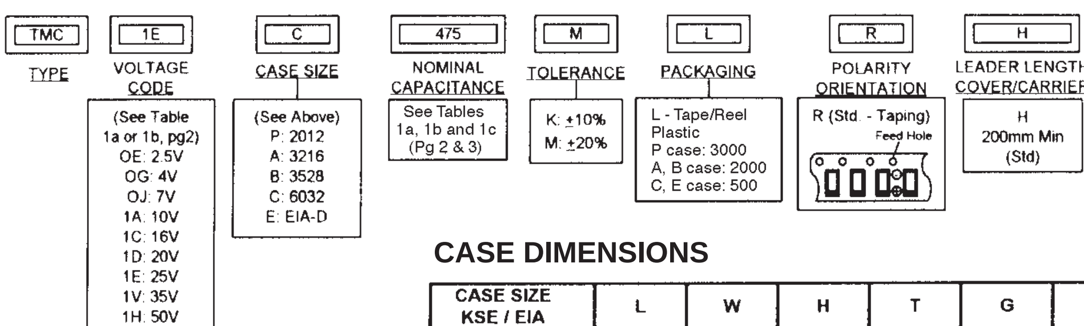
The TMC Series of molded tantalum chip capacitors offers an extensive range of values in EIA - US and EIA - Japan compatible sizes. By design, strict process control and a commitment to provide the most reliable product in the industry, the TMC has passed our customers' most severe humidity / temperature / pressure induced life stress testing. For surface mount applications, the space saving, highly reliable TMC is the preferred tantalum chip capacitor.

2. Features

- Epoxy Molded Body, UL94V-0 Flammability
- EIA - US and EIA - Japan Compatible Sizes
- 100% Burn-in and End-of-Line Testing
- Extended Values Per Case Size
- Excellent Humidity and Solder Resistance

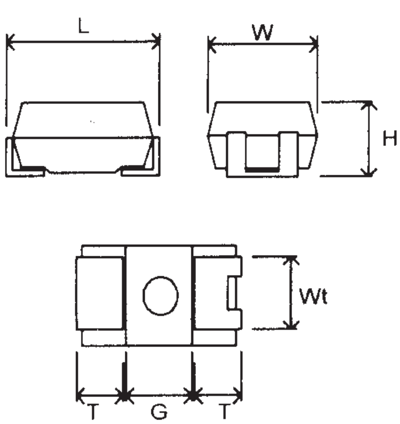
3. Type Designation

The type designation shall be the following form:



CASE DIMENSIONS

CASE SIZE KSE / EIA		L	W	H	T	G	Wt
P/2012	mm	2.0 ± 0.2	1.25±0.2	1.2 MAX	0.5 ± 0.3	0.8 MIN	0.9 ± 0.1
	in	0.078 ±0.008	0.049 ±0.008	0.05 MAX	0.020 ±0.012	0.03 MIN	0.035 ±0.004
A/3216	mm	3.2 ± 0.2	1.6 ± 0.2	1.6 ± 0.2	0.7 ± 0.3	1.4 ± 0.2	1.2 ± 0.2
	in	0.126 ±0.008	0.063 ±0.008	0.063 ±0.008	0.028 ±0.012	0.055 ±0.008	0.047 ±0.008
B/3528	mm	3.5 ± 0.2	2.8 ± 0.2	1.9 ± 0.2	0.8 ± 0.3	1.4 ± 0.2	2.2 ± 0.2
	in	0.138 ±0.008	0.110 ±0.008	0.073 ±0.008	0.031 ±0.012	0.055 ±0.008	0.087 ±0.008
C/6032	mm	6.0 ± 0.3	3.2 ± 0.2	2.5 ± 0.2	1.3 ± 0.3	2.4 ± 0.2	2.2 ± 0.2
	in	0.236 ±0.012	0.126 ±0.008	0.098 ±0.008	0.051 ±0.012	0.094 ±0.008	0.087 ±0.008
E/7343 (EIA-D)	mm	7.3 ± 0.3	4.3 ± 0.3	2.8 ± 0.2	1.3 ± 0.3	3.8 ± 0.2	2.4 ± 0.1
	in	0.287 ±0.012	0.169 ±0.012	0.110 ±0.008	0.051 ±0.012	0.15 ±0.008	0.094 ±0.004



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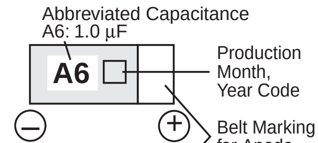
STANDARD RANGE

CASE SIZE (Table 1a)

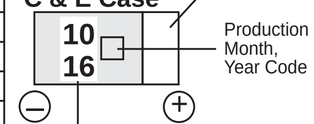
STANDARD VALUES VOLTAGE CODE		0G	0J	1A	1C	1D	1E	1V	1H
85°C	RATED VOLTAGE (VDC)	4	7	10	16	20	25	35	50
	SURGE VOLTAGE (VDC)	5	9	13	20	26	32	46	63
125°C	DERATED VOLTAGE (VDC)	2.5	4	6.3	10	13	16	23	32
CAPACITANCE (uF)	CAP CODE								
0.1	104							A	A
0.15	154							A	B
0.22	224							A	B
0.33	334							A	B
0.47	474						A	B	C
0.68	684					A		B	C
1.0	105				A			B	C
1.5	155			A			B	C	E
2.2	225		A			B		C	E
3.3	335	A			B			C	
4.7	475			B			C	E	
6.8	685		B			C		E	
10	106	B			C		E		
15	156			C		E			
22	226		C		E				
33	336	C		E					
47	476		E						
68	686	E							

PART MARKING

A & B Case



C & E Case



Upper number indicates capacitance in µF.
Lower number indicates rated voltage (16V).

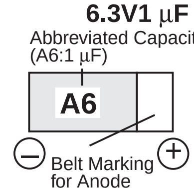
Marking	Value (uF)
A5	0.10
E5	0.15
J5	0.22
N5	0.33
S5	0.47
W5	0.68
A6	1.0
E6	1.5
J6	2.2
N6	3.3
S6	4.7
W6	6.8
A7	10.0

CASE SIZE (Table 1b) TMCP series

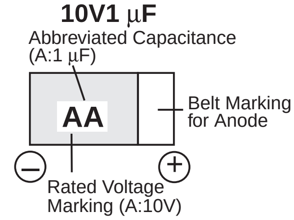
STANDARD VALUES VOLTAGE CODE		OE	0G	0J	1A	1C	1D	1E
RATED VOLTAGE (VDC)		2.5	4	6.3	10	16	20	25
CAPACITANCE (uF)	CAP CODE							
0.047	473							P
0.068	683							P
0.10	104						P	
0.15	154						P	
0.22	224						P	
0.33	334						P	
0.47	474					P	P	
0.68	684				P	P	P	
1.0	105			P	P	P		
1.5	155		P	P	P			
2.2	225	P	P	P	P			
3.3	335	P	P	P	P			
4.7	475	P	P	P	P			
6.8	685	P	P	P				
10.0	106	P	P	P				
15.0	156	P	P					
22.0	226	P	P					

PART MARKING

6.3V1 µF



10V1 µF



In case that simple capacitance symbol is same as case size, rated voltage symbol is marking on higher voltage one.

When marking the symbol of rated voltage and capacitance, a multipler of capacitance symbol is omitted.

Simple symbol is referenced to JIS C 5143 clause 10, and EIAJ RC-3813 clause 7.1.

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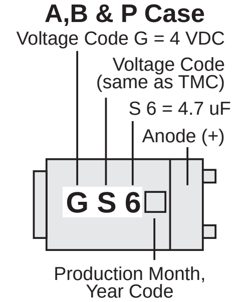
EXTENDED RANGE

CASE SIZE (Table 1c) Includes Standard and P case sizes

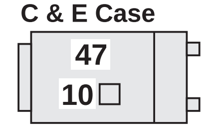
STANDARD VALUES VOLTAGE CODE		0E	0G	0J	1A	1C	1D	1E	1V	1H
85°C	RATED VOLTAGE (VDC)	2.5	4	7	10	16	20	25	35	50
	SURGE VOLTAGE (VDC)	3.2	5	9	13	20	26	32	46	63
125°C	DERATED VOLTAGE (VDC)	1.6	2.5	4	6.3	10	13	16	23	32
CAPACITANCE (uF)	CAP CODE									
0.047	473							P		
0.068	683							P		
0.10	104						P		A	A
0.15	154						P		A	AB
0.22	224						P		A	AB
0.33	334						P		A	B
0.47	474					P	P	A	AB	BC
0.68	684				P	P	AP	A	AB	BC
1.0	105			P	P	AP	A	A	AB	C
1.5	155		P	P	AP	A	A	AB	BC	CE
2.2	225	P	P	AP	AP	A	AB	B	BC	CE
3.3	335	P	AP	AP	AP	AB	AB	B	BC	E
4.7	475	P	AP	AP	ABP	AB	ABC	BC	CE	E
6.8	685	AP	AP	ABP	AB	AB	BC	C	CE	
10.0	106	AP	ABP	ABP	AB	ABC	BC	CE	CE	
15.0	156	AP	ABP	AB	ABC	BC	CE	CE	E	
22.0	226	ABP	ABP	ABC	BC	BCE	CE	E	E	
33.0	336	AB	ABC	ABC	BCE	CE	E	E		
47.0	476	AB	ABC	BCE	BCE	CE	E			
68.0	686	BC	BCE	BCE	CE	E				
100	107	BC	BCE	BCE	CE	E				
150	157	CE	CE	BCE	E					
220	227	CE	CE	E	E					
330	337	E	E	E						
470	477	E	E							

PART MARKING

A,B & P Case



C & E Case



Marking	Voltage
e	2.5
G	4
J	7
A	10
C	16
D	20
E	25
V	35
H	50

NOTE: To obtain ENVIRONMENTAL SPECIFICATIONS INFORMATION please contact KOA Speer.

TECHNICAL DATA

Part No.	EIA Case	μF	Leakage μA (MAX)	TanD % max	ESR Max (Ω) 100 kHz
2.5 VDC @ 85°C					
TMCOEP225	P	2.2	0.50	8	25.0
TMCOEP335	P	3.3	0.50	8	25.0
TMCOEP475	P	4.7	0.50	8	12.0
TMCOEP685	P	6.8	0.50	8	10.0
TMCOEA685	A	6.8	0.50	6	6.5
TMCOEP106	P	10	0.50	8	9.0
TMCOEA106	A	10	0.50	8	6.0
TMCOEP156	P	15	0.50	8	8.0
TMCOEA156	A	15	0.50	8	4.0
TMCOEP226	P	22	0.55	8	7.0
TMCOEA226	A	22	0.55	8	2.8
TMCOEB226	B	22	0.55	8	2.5
TMCOEA336	A	33	0.83	8	4.0
TMCOEB336	B	33	0.83	8	2.8
TMCOGA476	A	47	1.18	12	3.0
TMCOEB476	B	47	1.18	8	2.4
TMCOEB686	B	68	1.70	8	1.8
TMCOEC686	C	68	1.70	8	1.6
TMCOEB107	B	100	2.50	12	0.9
TMCOEC107	C	100	2.50	8	0.9
TMCOEC157	C	150	3.75	8	0.9

Part No.	EIA Case	μF	Leakage μA (MAX)	TanD % max	ESR Max (Ω) 100 kHz
2.5 VDC @ 85°C *continued*					
TMCOEE157	D	150	3.75	8	0.9
TMCOEC227	C	220	5.50	8	0.9
TMCOEE227	D	220	5.50	8	0.9
TMCOEE337	D	330	8.25	10	0.9
TMCOEE477	D	470	11.75	10	0.5
4.0 VDC @ 85°C					
TMCOGP155	P	1.5	0.50	8	25.0
TMCOGP225	P	2.2	0.50	8	25.0
TMCOGP335	P	3.3	0.50	8	20.0
TMCOGA335	A	3.3	0.50	6	9.0
TMCOGP475	P	4.7	0.50	8	12.0
TMCOGA475	A	4.7	0.50	6	7.5
TMCOGP685	P	6.8	0.50	8	10.0
TMCOGA685	A	6.8	0.50	6	6.5
TMCOGP106	P	10	0.50	8	9.0
TMCOGA106	A	10	0.50	6	3.0
TMCOGB106	B	10	0.50	6	4.0
TMCOGP156	P	15	0.60	8	8.0
TMCOGA156	A	15	0.60	8	4.0
TMCOGB156	B	15	0.60	8	3.0

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TECHNICAL DATA *(continued)*

Part No.	EIA Case	µF	Leakage µA (MAX)	TanD % max	ESR Max (Ω) 100 kHz
4.0 VDC @ 85°C *continued*					
TMCOGP226	P	22	0.88	8	6.0
TMCOGA226	A	22	0.88	8	2.8
TMCOGB226	B	22	0.88	8	2.5
TMCOGA336	A	33	1.32	8	4.0
TMCOGB336	B	33	1.32	8	2.8
TMCOGC336	C	33	1.32	6	2.0
TMCOGA476	A	47	1.88	12	4.0
TMCOGB476	B	47	1.88	8	2.4
TMCOGC476	C	47	1.88	8	1.8
TMCOGB686	B	68	2.72	8	1.8
TMCOGC686	C	68	2.72	8	1.6
TMCOGE686	D	68	2.72	6	1.1
TMCOGB107	B	100	4.00	12	4.0
TMCOGC107	C	100	4.00	8	0.9
TMCOGE107	D	100	4.00	8	0.9
TMCOGC157	C	150	6.00	8	0.9
TMCOGE157	D	150	6.00	8	0.9
TMCOGC227	C	220	8.80	12	4.0
TMCOGE227	D	220	8.80	8	0.9
TMCOGE337	D	330	13.20	10	0.9
TMCOGE477	D	470	18.80	10	0.5
7.0 VDC @ 85°C					
TMCOJP105	P	1.0	0.50	6	25.0
TMCOJP155	P	1.5	0.50	6	25.0
TMCOJP225	P	2.2	0.50	8	25.0
TMCOJA225	A	2.2	0.50	6	8.0
TMCOJP335	P	3.3	0.50	8	12.0
TMCOJA335	A	3.3	0.50	6	7.0
TMCOJP475	P	4.7	0.50	8	10.0
TMCOJA475	A	4.7	0.50	6	6.0
TMCOJP685	P	6.8	0.50	8	9.0
TMCOJA685	A	6.8	0.50	6	5.0
TMCOJB685	B	6.8	0.50	6	4.0
TMCOJP106	P	10	0.50	8	8.0
TMCOJA106	A	10	0.70	8	4.0
TMCOJB106	B	10	0.70	8	3.0
TMCOJA156	A	15	1.05	8	2.8
TMCOJB156	B	15	1.05	8	2.5
TMCOJA226	A	22	1.54	8	4.0
TMCOJB226	B	22	1.54	8	2.3
TMCOJC226	C	22	1.54	6	2.0
TMCOJA336	A	33	2.31	10	4.0
TMCOJB336	B	33	2.31	8	2.0
TMCOJC336	C	33	2.31	8	1.8
TMCOJB476	B	47	3.29	8	1.8
TMCOJC476	C	47	3.29	8	1.6
TMCOJE476	D	47	3.29	6	1.1
TMCOJB686	B	68	4.28	10	4.0
TMCOJC686	C	68	4.76	8	1.5
TMCOJE686	D	68	4.76	8	0.9
TMCOJB107	B	100	6.30	8	4.0
TMCOJC107	C	100	7.00	8	0.9
TMCOJE107	D	100	7.00	8	0.9
TMCOJB157	B	150	6.00	8	4.0
TMCOJC157	C	150	9.45	10	4.0
TMCOJE157	D	150	10.50	8	0.9
TMCOJE227	D	220	15.40	8	0.9

Part No.	EIA Case	µF	Leakage µA (MAX)	TanD % max	ESR Max (Ω) 100 kHz
7.0 VDC @ 85°C *continued*					
TMCOJE337	D	330	23.10	10	0.5
10 VDC @ 85°C					
TMC1AP684	P	0.68	0.50	6	25.0
TMC1AP105	P	1.0	0.50	6	25.0
TMC1AP155	P	1.5	0.50	8	20.0
TMC1AA155	A	1.5	0.50	6	10.0
TMC1AP225	P	2.2	0.50	8	15.0
TMC1AA225	A	2.2	0.50	6	7.0
TMC1AP335	P	3.3	0.50	8	10.0
TMC1AA335	A	3.3	0.50	6	5.5
TMC1AP475	P	4.7	0.50	8	9.0
TMC1AA475	A	4.7	0.50	6	5.0
TMC1AB475	B	4.7	0.50	6	4.0
TMC1AA685	A	6.8	0.68	6	3.6
TMC1AB685	B	6.8	0.68	6	3.0
TMC1AA106	A	10	1.00	8	2.8
TMC1AB106	B	10	1.00	8	2.5
TMC1AA156	A	15	1.50	8	3.2
TMC1AB156	B	15	1.50	8	2.8
TMC1AC156	C	15	1.50	6	2.0
TMC1AB226	B	22	2.20	8	2.0
TMC1AC226	C	22	2.20	8	1.8
TMC1AB336	B	33	3.30	8	1.8
TMC1AC336	C	33	3.30	8	1.6
TMC1AE336	D	33	3.30	6	1.1
TMC1AB476	B	47	4.70	10	4.0
TMC1AC476	C	47	4.70	8	1.1
TMC1AE476	D	47	4.70	8	0.9
TMC1AC686	C	68	6.80	8	0.9
TMC1AE686	D	68	6.80	8	0.9
TMC1AC107	C	100	10.00	10	4.0
TMC1AE107	D	100	10.00	8	0.9
TMC1AE157	D	150	15.00	8	0.9
TMC1AE227	D	220	22.00	8	0.6
16 VDC @ 85°C					
TMC1CP474	P	0.47	0.50	6	25.0
TMC1CP684	P	0.68	0.50	6	25.0
TMC1CP105	P	1.0	0.50	6	20.0
TMC1CA105	A	1.0	0.50	4	11.0
TMC1CA155	A	1.5	0.50	6	8.0
TMC1CA225	A	2.2	0.50	6	6.5
TMC1CA335	A	3.3	0.53	6	5.0
TMC1CB335	B	3.3	0.53	6	4.5
TMC1CA475	A	4.7	0.75	6	4.0
TMC1CB475	B	4.7	0.75	6	3.5
TMC1CA685	A	6.8	1.09	6	3.0
TMC1CB685	B	6.8	1.09	6	2.5
TMC1CA106	A	10	1.60	8	4.0
TMC1CB106	B	10	1.60	8	2.8
TMC1CC106	C	10	1.60	6	2.0
TMC1CB156	B	15	2.40	8	2.0
TMC1CC156	C	15	2.40	8	1.8
TMC1CC226	C	22	3.52	8	1.6
TMC1CE226	D	22	3.52	6	1.1
TMC1CC336	C	33	5.28	8	1.1
TMC1CE336	D	33	5.28	8	0.9

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TECHNICAL DATA *(continued)*

Part No.	EIA Case	µF	Leakage µA (MAX)	TanD % max	ESR Max (Ω) 100 kHz
16 VDC @ 85°C *continued*					
TMC1CC476	C	47	7.52	8	1.2
TMC1CE476	D	47	7.52	8	0.9
TMC1CE686	D	68	10.90	8	0.9
TMC1CE107	D	100	16.00	8	0.9
20 VDC @ 85°C					
TMC1DP104	P	0.10	0.50	6	25.0
TMC1DP154	P	0.15	0.50	6	25.0
TMC1DP224	P	0.22	0.50	6	25.0
TMC1DP334	P	0.33	0.50	6	25.0
TMC1DP474	P	0.47	0.50	6	25.0
TMC1DP684	P	0.68	0.50	6	25.0
TMC1DA684	A	0.68	0.50	4	12.0
TMC1DA105	A	1.0	0.50	4	8.0
TMC1DA155	A	1.5	0.50	6	6.5
TMC1DA225	A	2.2	0.50	6	5.0
TMC1DB225	B	2.2	0.50	6	3.5
TMC1DA335	A	3.3	0.66	6	3.5
TMC1DB335	B	3.3	0.66	6	3.0
TMC1DA475	A	4.7	0.94	6	3.0
TMC1DB475	B	4.7	0.94	6	3.0
TMC1DB685	B	6.8	1.36	6	2.5
TMC1DC685	C	6.8	1.36	6	2.0
TMC1DB106	B	10	2.00	8	2.0
TMC1DC106	C	10	2.00	8	1.9
TMC1DC156	C	15	3.00	8	1.7
TMC1DE156	D	15	3.00	6	1.1
TMC1DC226	C	22	4.40	8	1.1
TMC1DE226	D	22	4.40	8	0.9
TMC1DD336	J	33	6.60	8	0.9
TMC1DE336	D	33	6.60	8	0.9
TMC1DE476	D	47	9.40	8	0.9
25 VDC @ 85°C					
TMC1EP473	P	0.047	0.50	6	25.0
TMC1EP683	P	0.068	0.50	6	25.0
TMC1EA474	A	0.47	0.50	4	14.0
TMC1EA684	A	0.68	0.50	4	10.0
TMC1EA105	A	1.0	0.50	4	8.0
TMC1EA155	A	1.5	0.50	6	7.5
TMC1EB155	B	1.5	0.50	6	5.0
TMC1EB225	B	2.2	0.55	6	4.5
TMC1EB335	B	3.3	0.83	6	3.5
TMC1EB475	B	4.7	1.18	6	3.0
TMC1EC475	C	4.7	1.18	6	2.4
TMC1EC685	C	6.8	1.70	6	2.0
TMC1EC106	C	10	2.50	8	1.8
TMC1EE106	D	10	2.50	6	1.2
TMC1EE156	D	15	3.75	8	1.0
TMC1EE226	D	22	5.50	8	0.9
TMC1EE336	D	33	8.25	8	0.9
35 VDC @ 85°C					
TMC1VA104	A	0.1	0.50	4	24.0
TMC1VA154	A	0.15	0.50	4	21.0
TMC1VA224	A	0.22	0.50	4	18.0
TMC1VA334	A	0.33	0.50	4	15.0
TMC1VA474	A	0.47	0.50	4	12.0

Part No.	EIA Case	µF	Leakage µA (MAX)	TanD % max	ESR Max (Ω) 100 kHz
35 VDC @ 85°C *continued*					
TMC1VB474	B	0.47	0.50	4	10.0
TMC1VA684	A	0.68	0.50	4	8.0
TMC1VB684	B	0.68	0.50	4	8.0
TMC1VA105	A	1.0	0.50	4	7.0
TMC1VB105	B	1.0	0.50	4	6.5
TMC1VB155	B	1.5	0.53	6	5.2
TMC1VC155	C	1.5	0.53	6	4.5
TMC1VB225	B	2.2	0.77	6	4.2
TMC1VC225	C	2.2	0.77	6	3.5
TMC1VB335	B	3.3	1.16	6	3.0
TMC1VC335	C	3.3	1.16	6	2.5
TMC1VC475	C	4.7	1.65	6	2.2
TMC1VE475	D	4.7	1.65	6	1.5
TMC1VC685	C	6.8	2.38	6	1.5
TMC1VE685	D	6.8	2.38	6	1.3
TMC1VC106	C	10	3.5	8	1.6
TMC1VE106	D	10	3.50	8	1.0
TMC1VE156	D	15	5.25	8	1.0
TMC1VE226	D	22	7.70	6	0.9
50 VDC @ 85°C					
TMC1HA104	A	0.1	0.50	4	22.0
TMC1HA154	A	0.15	0.50	4	16.0
TMC1HB154	B	0.15	0.50	4	17.0
TMC1HA224	A	0.22	0.50	4	18.0
TMC1HB224	B	0.22	0.50	4	14.0
TMC1HB334	B	0.33	0.50	4	12.0
TMC1HB474	B	0.47	0.50	4	10.0
TMC1HC474	C	0.47	0.50	4	8.0
TMC1HB684	B	0.68	0.50	4	7.0
TMC1HC684	C	0.68	0.50	4	7.0
TMC1HC105	C	1.0	0.50	4	5.5
TMC1HC155	C	1.5	0.75	6	4.0
TMC1HE155	D	1.5	0.75	6	4.0
TMC1HC225	C	2.2	1.10	6	2.5
TMC1HE225	D	2.2	1.10	6	2.5
TMC1HE335	D	3.3	1.65	6	2.0
TMC1HE475	D	4.7	3.35	6	1.4

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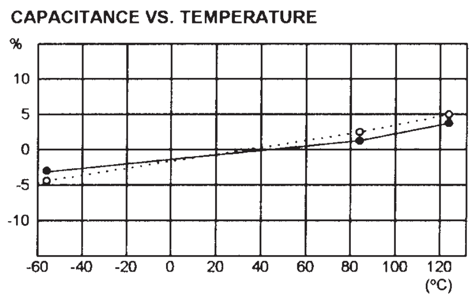
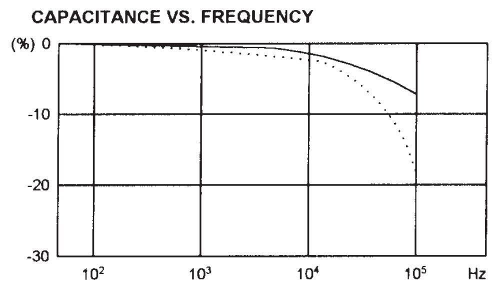
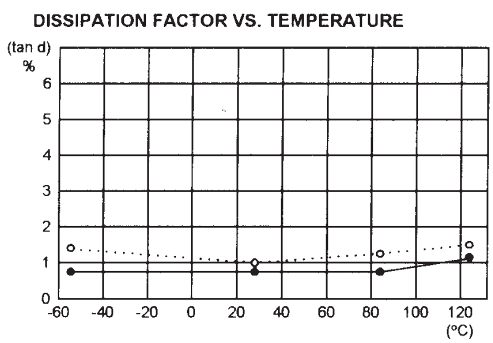
TYPICAL PERFORMANCE CHARACTERISITICS

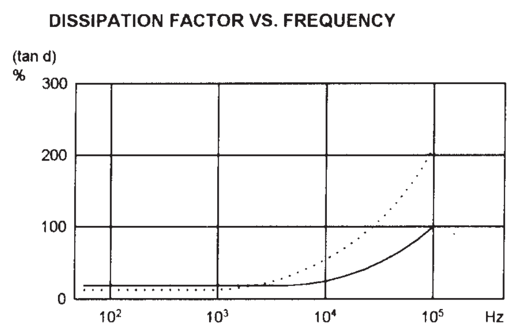
TEMPERATURE CHARACTERISTICS
———— **TMC 16V, 1µf**
- - - - - - **TMC 16V, 3.3µf**

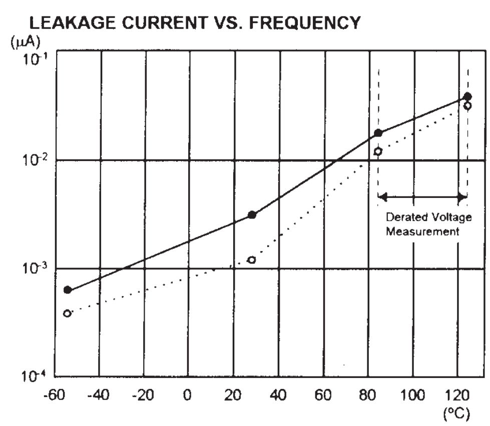
TEMPERATURE CHARACTERISTICS
———— **TMC 20V, 0.68µf**
- - - - - - **TMC 20V, 2.2µf**

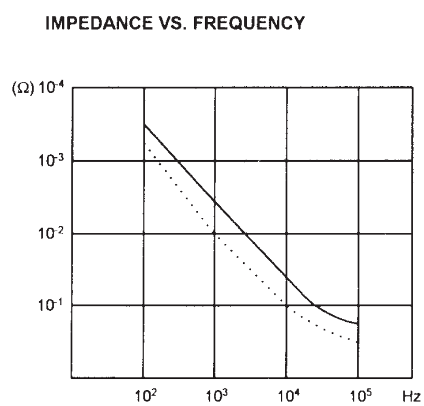












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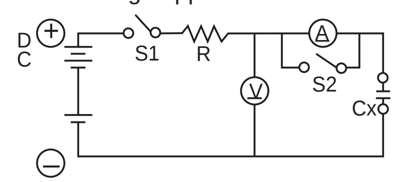
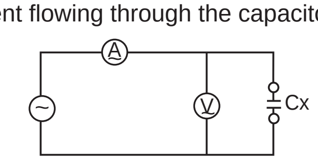
4. Characteristics
4.1 Electrical characteristics

No.	Items	Requirement	Test Method Guideline
1	Rated Voltage	2.5V to 50VDC	-55°C to +85°C
2	Maximum Permissible Ripple Voltage	Refer to page 18	Keep the sum of peak DC voltage and ripple voltage within the rated voltage and never go over it.
3	Nominal Capacitance	0.10µF to 470µF (±10% or ±20%)	Measuring frequency: 120 ± 12Hz Measuring voltage: 0.5Vrms +0.5 ~ 2.0 VDC Measurement circuit: Equivalent series circuit 
4	Dissipation Factor (DF) Tangent of Loss Angle (tan δ)	See techincal data tables for details.	Measurement shall be made under the same conditions as those given for the measurement of capacitance.
5	D.C. Leakage Current (CC)	Less than 0.01CV(µA) or 0.5 (µA), whichever is the greater. C=nominal capacitance (µF) V=rated voltage (VDC)	Apply the rated voltage through 1000 ±100Ω protective resistor, and measure the current after 5 minutes voltage application.  R : Series Protective Resistor Ⓐ : DC Current Meter or Electronic Current Meter Ⓥ : DC Voltage Meter S1 : Switch S2 : Protective Switch for Current Meter Cx : Capacitor Sample
6	Impedance High Frequency	Capacitance (µF) / Impedance Value: Less than 0.47 / —- 0.68 to 1.5 / Less than 20Ω 2.2 to 6.8 / Less than 10Ω More than 10 / Less than 4Ω Cx : Capacitor Sample ~ : AC Power Source Ⓐ : AC Current Meter Ⓥ : AC Voltage Meter	AC voltage (0.5Vrms or less) of a frequency specified below, shall be applied and the voltage drop across the capacitor terminals shall be measured. The impedance shall be calculated by the following equation. Frequency: 100 ± 10kHz Impedance: (Z) = E/I where E: Voltage drop across the capacitor terminals I: Current flowing through the capacitor 

4. Characteristics
4.1 Electrical Characteristics

No.	Items	Requirement	Test Method Guideline
7	Temperature Characteristics		

Step	Temperature	Duration
1	20 ± 2°C	—
2	-55 ± 3°C	2 hours
3	20 ± 2°C	0.25 hours
4	85 ± 2°C	2 hours
5	125 ± 2°C	2 hours

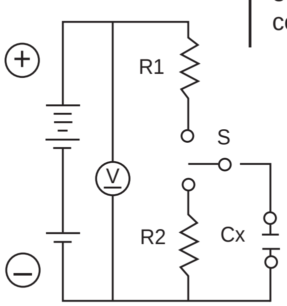
Table 3

Capacitance (µF)	-55°C	+85°C	+125°C
0.047 to 1.0	Less than 0.09	Less than 0.07	Less than 0.09
1.5 to 6.8	Less than 0.10	Less than 0.08	Less than 0.10
10 to 470	Less than 0.12	Less than 0.10	Less than 0.12

Step	Item	Requirement
Step 2	Change in capacitance	Relative to the value in step 1 - 10 to 0%
	Tangent of loss angle	Not more than the value in Table 3
Step 4	Change in capacitance	Relative to the value in step 1 - 0 to +10%
	Leakage current	0.1CV or 5 µ A or less
	Tangent of loss angle	Not more than the value in Table 3
Step 5	Change in capacitance	Relative to the value in step 1 - 0 to +12%
	Leakage current	0.125CV or 6.25 µ A or less
	Tangent of loss angle	Not more than the value in Table 3

Step 1: Capacitance and tangent of loss angle shall be measured.
Step 2: After the capacitor has been stored for 2 hours, capacitance and tangent of loss angle shall be measured. The measurement shall be made at thermal equilibrium.
Step 4, 5: After the capacitor has been stored for 2 hours, capacitance, tangent of loss angle and leakage current shall be measured. The measurement shall be made a thermal equilibrium. However, measurement shall be made at a temperature derating voltage in step 5.

No.	Items	Requirement
8	Surge Test	The capacitor shall be subjected to the surge voltage as specified below in a cycle of 6±0.5min. which consists of a charge period of 30±5 sec. followed by a discharge period of approx. 5 min. 30 sec. at 85±2°C for 1000 cycles. The capacitor shall be stored under standard atmospheric conditions to obtain thermal equilibrium, after which measurement shall be made.

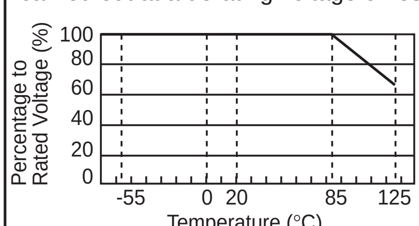


R1: Series Protective Resistor (33Ω)
R2: Discharge Resistor (33Ω)
(V): DC Voltmeter
Cx: Test Capacitor
S: Switch

Change in capacitance	Relative to the value before test +5%
Tangent of loss angle	Clause 4.1.4 shall be satisfied
Leakage current	Clause 4.1.5 shall be satisfied

Rated voltage (V)	2.5	4	7	10	16	20	25	35	50
Surge voltage (V)	3.2	5	8	13	20	26	32	45	63

No.	Items	Requirement
9	Temperature Derated Voltage	When operating at an ambient temperature range from 85°C to 125°C, the operation shall be carried out at a derating voltage or less as shown below.



Derating voltage Vt at any temperature T between 85°C and 125°C shall be calculated by the following formula:

$$V_t = Vr - \frac{Vr - Vd}{40}(T - 85)$$

Vr: Rated voltage
Vd: Derating voltage at 125°C

Temperature (°C)

Rated voltage (V)	2.5	4	7	10	16	20	25	35	50
Derating voltage at 125°C (V)	1.6	2.5	4	6.3	10	13	16	22	32

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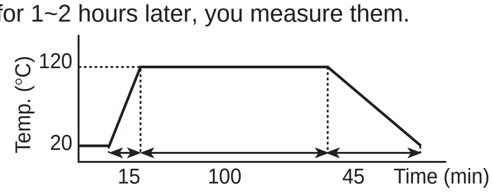
4. Characteristics
4.2 Endurance Characteristics *(continued)*

<table>
<tr><th>No.</th><th>Items</th><th>Conditions</th><th colspan="2">Specifications</th></tr>
<tr><td>1</td><td>Solderability</td><td>Test Temperature:
235 ± 5°C for 2 ± 0.5 seconds.
Others are based on JIS C 5102 clause 8.4.
(Test Method is according to Clause 1.)</td><td colspan="2">A new uniform coating of solder shall cover a minimum of 75% of the surface being immersed.</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">Resistance to Soldering Heat</td><td rowspan="4">The methods are in accordance with JIS C 5143 Appendix I and II.
After preheat of 5 minutes at 150°C.
Immersion at 260 ± 5°C
10 ± 1 seconds for A, B cases.
5 ± 0.5 seconds for C, D, E cases.
Reflow at 260 ± 5°C
10 ± 1 seconds.
<u>Soldering iron method</u>
(1) 25 watt soldering iron: Less than 3 seconds at one side with 350 $^{+0}_{-10}$ °C
(2) 30 watt soldering iron: Less than 3 seconds at one side with 300±10°C
Re-soldering shall be one time only.</td><td>Change in capacitance</td><td>Relative to the value before test ±5%</td></tr>
<tr><td>Tangent of loss angle</td><td>Clause 4.1.4 shall be satisfied</td></tr>
<tr><td>Leakage current</td><td>Clause 4.1.5 shall be satisfied</td></tr>
<tr><td>Appearance</td><td>There shall be no defoma-tion of case or distinct looseness of electrodes</td></tr>
<tr><td rowspan="4">3</td><td rowspan="4">Surface Mounting by Soldering (2 times)
↓
Screening to Heat</td><td rowspan="4">After surface mounting by soldering (2 times), if you do screening to heat capacitors, it is for temperature process to establish to under drawing of Temperature - Time. Leaving them for 1~2 hours later, you measure them.

</td><td>Change in capacitance</td><td>Relative to the value before test ±10%</td></tr>
<tr><td>Tangent of loss angle</td><td>Clause 4.1.4 shall be satisfied</td></tr>
<tr><td>Leakage current</td><td>Not more than 125% of initial value (Clause 4.1.5)</td></tr>
<tr><td>Appearance</td><td>No remarkable abnormality and markings shall be legible</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Vibration</td><td rowspan="4">The TMC capacitors will withstand 6 hours of vibration testing, 2 hours in each of three mutually perpendicular planes. The frequency will vary from 10 Hz to 55 Hz and back to 10 Hz over a one minute period, continuously during each 2 hour test, with a total excursion of 1.5 mm. During the last 30 minutes of vibration, in each direction, electrical tests shall be conducted.</td><td>Change in capacitance</td><td>Within +5% of initial value</td></tr>
<tr><td>Tangent of loss angle</td><td>Within initial value specified</td></tr>
<tr><td>Leakage Current</td><td>Within initial value specified</td></tr>
<tr><td>Appearance</td><td>All markings shall be legible, no abnormalities</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">Damp Heat (steady state)</td><td rowspan="4">The capacitor shall be stored at a temperature of 40 ± 2°C and relative humidity of 90% to 95% for 500 $^{+24}_{0}$ hours. Then the capacitor shall be subjected to standard atmospheric conditions for 1 to 2 hours, after which measurements shall be made.</td><td>Change in capacitance</td><td>Relative to the value before test ±10%</td></tr>
<tr><td>Tangent of loss angle</td><td>Clause 4.1.4 shall be satisfied</td></tr>
<tr><td>Leakage</td><td>Clause 4.1.5 current shall be satisfied</td></tr>
<tr><td>Appearance</td><td>No remarkable abnormality and markings shall be legible</td></tr>
</table>

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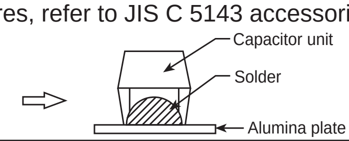
4. Characteristics

4.2 Endurance Characteristics *(continued)*

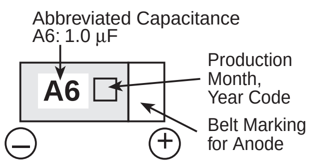
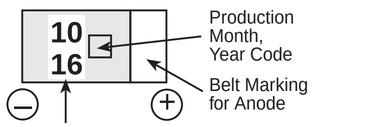
<table>
<tr><th>No.</th><th>Items</th><th>Conditions</th><th colspan="2">Specifications</th></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Electrical Endurance</td><td rowspan="4">Testing is conducted for 2,000 hours @ 85°C±2°C with the rated voltage applied through a 3Ω series protective resistor. Measurements will be taken after stabilization for 1 to 2 hours, at room temperature. The readings shall comply with the required specifications.</td><td>Change in capacitance</td><td>Relative to the value before test ±10%</td></tr>
<tr><td>Tangent of loss angle</td><td>Clause 4.1.4 shall be satisfied</td></tr>
<tr><td>Leakage current</td><td>Not more than 125% of initial value (Clause 4.1.5)</td></tr>
<tr><td>Appearance</td><td>No remarkable abnormality and markings shall be legible</td></tr>
<tr><td rowspan="3">7</td><td rowspan="3">Change in Temperature</td><td rowspan="3">The capacitor shall be subjected to each specified temperature for each specified period shown in the table below. These 4 steps constitutes one rotation. 5 continuous rotations shall be carried out.<table><tr><th>Step</th><th>Temperature (°C)</th><th>Duration</th></tr><tr><td>1</td><td>-55 ± 3</td><td>30 ± 3 min</td></tr><tr><td>2</td><td>Normal temperature</td><td>3 max</td></tr><tr><td>3</td><td>125 ± 2</td><td>30 ± 3 min</td></tr><tr><td>4</td><td>Normal temperature</td><td>3 max</td></tr></table></td><td>Change in capacitance</td><td>Relative to the value before test ±10%</td></tr>
<tr><td>Tangent of loss angle</td><td>Clause 4.1.4 shall be satisfied</td></tr>
<tr><td>Leakage current</td><td>Clause 4.1.5 shall be satisfied</td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Resistance to Damp Heat</td><td rowspan="4">Expose the capacitor to 40 ± 2°C at 90~95% RH and apply DC voltage equal to rated voltage through 1K ohm series protective resistor 500 ±12 hours. Then expose it for 4 hours in the standard atmospheric conditions and then, carry out the measurement.</td><td>Change in capacitance</td><td>Relative to the value before test ±10%</td></tr>
<tr><td>Tangent of loss angle</td><td>Not more than 150% of initial value (Clause 4.1.4)</td></tr>
<tr><td>Leakage current</td><td>Not more than 200% of initial value (Clause 4.1.5)</td></tr>
<tr><td>Appearance</td><td>No remarkable abnormality and markings shall be legible</td></tr>
<tr><td>9</td><td>Terminal Strength</td><td>The capacitor soldered to the alumina plate, is pushed sideway horizontally with 1.5Kg.F tensile load as shown below. For the other procedures, refer to JIS C 5143 accessories note 3.

</td><td colspan="2">There will be no evidence of mechanical degradation in terminals and the unit.</td></tr>
<tr><td rowspan="4">10</td><td rowspan="4">Resistance to Solvent</td><td rowspan="4">(1) Cleaning by Immersion I
Solvent: IPA
Immersion time: 5±1 minutes
Temperature: 20~25°C
(2) Cleaning by Immersion II
Solvent: Water
Immersion time: 5±1 minutes
Temperature: 55±5°C
(3) Ultrasonic cleaning
Frequency: 25±4kHz or 40^{+8}_{-4} kHz
Output power: Less than 20W/l
Time: 5 minutes
Temperature-IPA: 20~25°C Water: 55±5°C</td><td>Change in capacitance</td><td>Relative to the value before test +3%</td></tr>
<tr><td>Tangent of loss angle</td><td>Clause 4.1.4 shall be satisfied</td></tr>
<tr><td>Leakage current</td><td>Clause 4.1.5 shall be satisfied</td></tr>
<tr><td>Appearance</td><td>No abnormality between the capacitor and terminals.</td></tr>
</table>

5. Markings

5.1 Marking Methods

Markings are printed on the surface of the capacitor unit.

Table 4-Examples of markings on the unit

A, B cases	C, E cases	Lot Number Symbol
	 Upper number indicates capacitance in µF. Lower number indicates rated voltage (16V).	see table below

Lot Number Symbol

Year \ Month	1	2	3	4	5	6	7	8	9	10	11	12
1999	a	b	c	d	e	f	g	h	j	k	l	m
2000	n	p	q	r	s	t	u	v	w	x	y	z
2001	A	B	C	D	E	F	G	H	J	K	L	M
2002	N	P	Q	R	S	T	U	V	W	X	Y	Z

1999 Jan. fix as Code "a" and alphabetical order follows. (I, i, O, o are not being used)

5.2 Label Descriptions in minimum package unit

(1) Manufacturer's Name (2) Production Lot Number (3) Part Number (4) Rated Voltage
(5) Nominal Capacitance Value (6) Nominal Capacitance Tolerance (7) Quantity

Table-5 Tables of printed markings

cap \ WV	2.5 0E	4 0G	7 0J	10 1A	16 1C	20 1D	25 1E	35 1V	50 1H
0.10								104□	A5□
0.15								154□	E5□
0.22								224□	J5□
0.33								N5□	N5□
0.47							S5□	VS5□	HS5□ 0.47 50□
0.68						W5	EW5□	VW5□	HW5□ 0.68 50□
1.0					A6□	DA6□	EA6□	VA6□	1 50□
1.5				E6□	CE6□	DE6□	EE6□	VE6□ 1.5 35□	1.5 50□
2.2			J6□	AJ6□	CJ6□	DJ6□	EJ6□	VJ6□ 2.2 35□	2.2 50□
3.3		N6□	JN6□	AN6□	CN6□	DN6□	EN6□	VN6□ 3.3 35□	3.3 50□
4.7		GS6□	JS6□	AS6□	CS6□	DS6□	ES6□ 4.7 25□	4.7 35□	4.7 50□
6.8	eW6□	GW6□	JW6□ W6□	AW6□	CW6□	DW6□ 6.8 20□	6.8 25□	6.8 35□	
10	eA7□	GA7□ A7□	JA7□	AA7□	CA7□ 10 16□	DA7□ 10 20□	10 25□	10 35□	
15	eE7□	GE7□	JE7□	AE7□ 15 10□	CE7□ 15 16□	15 20□	15 25□	15 35□	
22	eJ7□	GJ7□	JJ7□ 22 7□	AJ7□ 22 10□	CJ7□ 22 16□	22 20□	22 25□		
33	eN7□	GN7□ 33 4□	JN7□ 33 7□	AN7□ 33 10□	33 16□	33 20□			
47	eS7□	GS7□ 47 4□	JS7□ 47 7	47 10□	47 16□	47 20□			
68	eW7□ 68 2.5□	GW7□ 68 4□	68 7□	68 10□	68 16□				
100	eA8□ 100 2.5□	100 4□	100 7□	100 10□	100 16□				
150	150 2.5□	150 4□	150 7□	150 10□					
220	220 2.5□	220 4□	220 7□	220 10□					
330	330 2.5□	330 4□	330 7□						
470	470 2.5□	470 4□							

Refer to pages 2 & 3 for case sizes.

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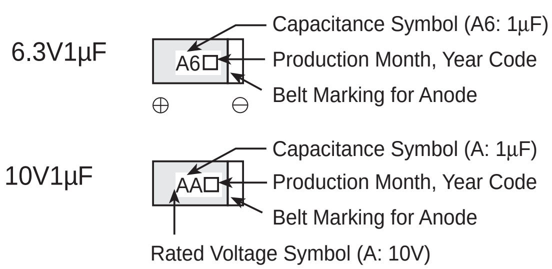
5.3 Marking Methods (P series only)

Markings are printed on the surface of the capacitor unit.

Examples of marking



- In case that simple capacitance symbol is same as case size, rated voltage symbol is marking on higher voltage one.
- When marking the symbol of rated voltage and capacitance, a multipler of capacitance symbol is omitted.
- Simple symbol is referenced to JIS C 5143 clause 10, and EIAJ RC-3813 clause 7.1.

5.4 3-2 Label Descriptions in Minimum Package Unit

(1) Manufacturer's Name (2) Production Lot Number (3) Part Number (4) Rated Voltage (5) Nominal Capacitance (6) Nominal Capacitance Tolerance (7) Quantity

Table 5.A1-Table of Rated Values and Marking

V,DC / µF	2.5	4	6.3	10	16	20	25	CAP CODE
	OE	OG	OJ	1A	1C	1D	1E	
0.047							ES □	473
0.068							EW □	683
0.10						DA □		104
0.15						DE □		154
0.22						DJ □		224
0.33						DN □		334
0.47					S5 □	DS □		474
0.68				W5□	CW□	DW□		684
1.0			A6□	AA□	CA□			105
1.5		E6 □	JE□	AE□				155
2.2	J6 □	GJ □	JJ □	AJ □				225
3.3	eN□	GN □	JN□	AN□				335
4.7	eS□	GS □	JS□	AS□				475
6.8	eW□	GW□	JW□					685
10	eA□	GA □	JA□					106
15	eE□	GE □						156
22	eJ □	GJ □						226

Refer to Page 2 for case sizes.

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6. Quality

6.1 Failure Rate

Not more than 1.0% per 1,000 hours

6.2 Series Circuit Resistance

Obtain series circuit resistance from Figure 1 (Percentage of Failure Rate vs. Circuit Resistance) and Figure 2 (Failure Rate Improvement Factors). As Failure Rate is based on 1Ω/V of series circuit resistance, it is 0.38% for 1,000 hours in case of 3Ω/V, for example.

6.3 Quality Assurance Requirements

MIL - STD - 105D Inspection level II, Normal inspection, single sampling.

Table 6

Items	AQL
Short, open	0.1%
Capacitance, Dissipation Factor, Leakage Current	0.4%
Appearance Dimensions, Constructions	0.65%

6.4 Endurance Test

Table 7

Group	Items	Sample Quantity	Permissible Number of Defectives	
1	Vibration	6	0	0
2	Solderability Terminal Strength, Humidity Resistance	6	0	
3	Stability at Low and High Temperature Surge Voltage	6	0	
4	High Temperature Load	6	0	
5	Resistance to Soldering Heat	6	0	

7. Others

7.1 Based on JIS C 5143 (1991 Edition) Characteristic LB and EIAJ RC 3813 Characteristic B

7.2 Method of Testing: JIS C 5102 (1994 Edition) and EIAJ RC 3813

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7. Others *(continued)*

Figure 1 - Circuit Resistance vs. Percentage of Failure Rate

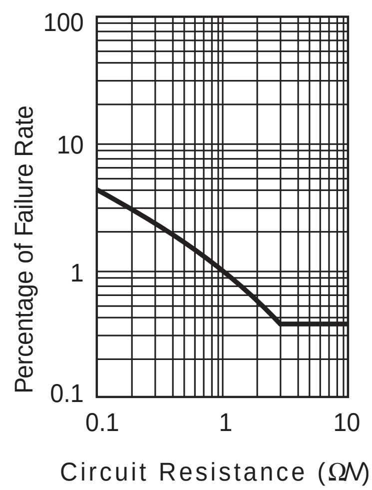
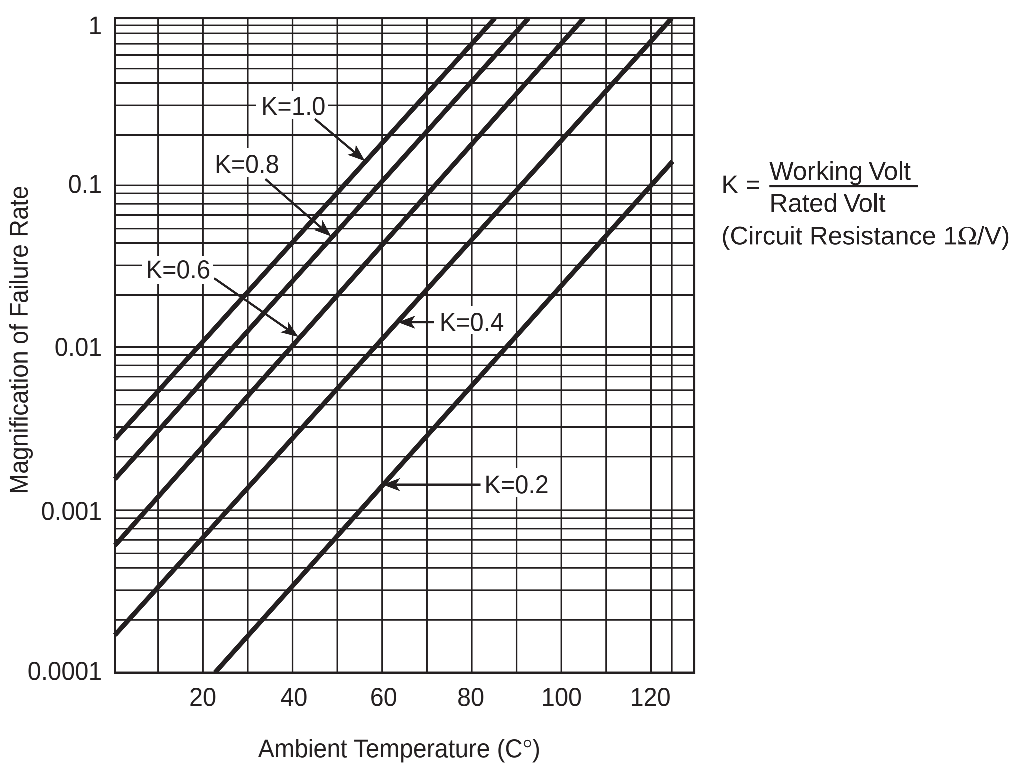


Figure 2 - Failure Rate Improvement Factors



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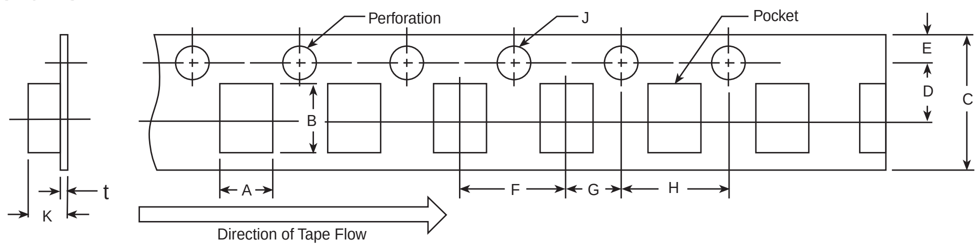
Carrier Tape Packaging Specifications

8. Product Symbol

TMC	OG	A	475	M	L	R	H
Series Code	Rated Voltage	Case Size	Nominal Capacitance	Capacitance Tolerance	Carrier Tape Packaging	Polarity Orientation	Leader Length

9. Dimensions of the carrier tape and standard parts quantity per reel

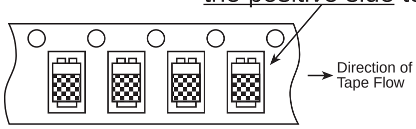
9.1 Dimensions



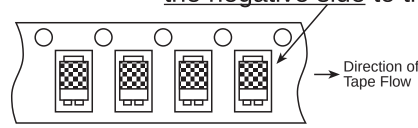
Description	Symbol	CASE SIZE					Tol.
		P	A	B	C	E	%
Pocket Width	A	1.5	1.9	3.1	3.7	4.8	0.1
Pocket Length	B	2.2	3.5	3.9	6.3	7.7	0.1
Pocket Pitch	F	4.0	4.0	4.0	8.0	8.0	0.1
Feed Hole Pitch	H	4.0	4.0	4.0	4.0	4.0	0.1
Feed Hole Diameter	J	1.5	1.5	1.5	1.5	1.5	+0.1-0.0
Feed Hole Position	E	1.75	1.75	1.75	1.75	1.75	0.1
Feed Hole to Pocket Center	D	3.5	3.5	3.6	5.5	5.5	0.1
	G	2.0	2.0	2.0	2.0	2.0	0.1
Tape Width	C	8.0	8.0	8.0	12.0	12.0	0.3
Tape Thickness	T	0.2	0.2	0.2	0.3	0.3	MAX
Overall Thickness	K	1.6	2.5	2.5	3	3.4	MAX

9.2 Inserting Direction (Polarity Orientation)

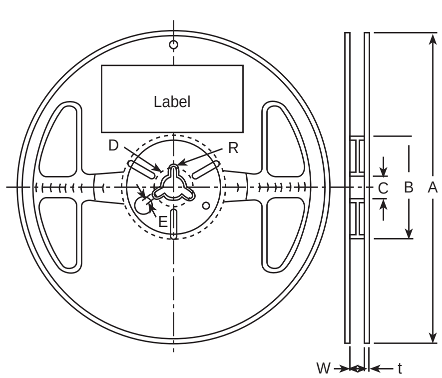
Polarity L: To be inserted with the positive side to the feed hole.



Polarity R: To be inserted with the negative side to the feed hole.



9.3 Reel Dimensions



(Unit: mm)

Tape width	8	12
A^{0}_{-3}	ø 180	←
B^{+1}_{0}	ø 60	←
C ± 0.2	ø 13	←
D ± 0.8	ø 21	←
E ± 0.5	2.0	←
W ± 0.3	9.0	13.0
t ± 0.4	1.3	←
R ± 0.4	10.5	←

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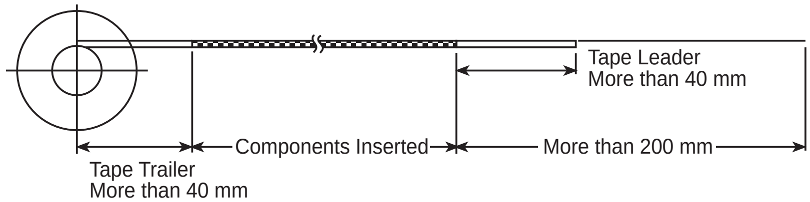
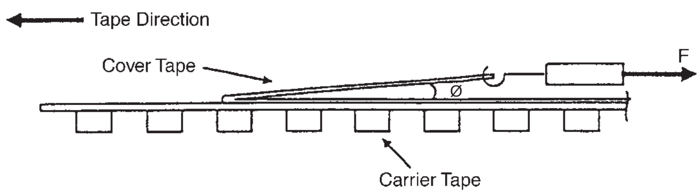
9.4 Tape leader and Trailer



10. Packaging Specifications

10.1 Peel - off Strength of Cover Tape

In the following method, F + 0.294 ± 0.196N shall be maintained, when cover tape is peeled off.



Ø = 10 to 15 degrees
F = 0.294 ± 0.196N
Peel - off
Speed 0.005m/s

10.2 Component Insertion on Reel

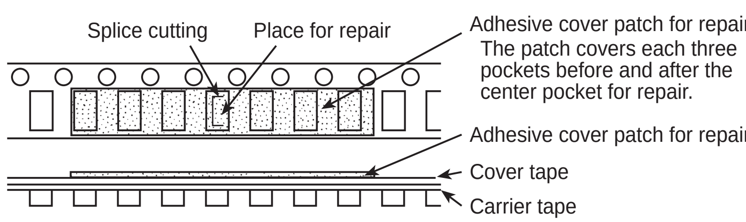
(1) It is required that the number of empty places in the tape per reel shall not exceed two per 1,000 pcs without consecutive empty places.

(2) Components in the tape are to be prevented from overturning, reverse turning and side turning in the pocket holes.

10.3 Splicing (Cover Tape)

The method of correcting improperly inserted component on reel.

(A) Cut three sides of a cover tape over the pocket hole where the component is improperly inserted and put the transparent adhesive tape on it. The adhesive tape shall not go over the sealing width of a cover tape.



11. Marking on Reel

Principally, markings on reel cover following items on label.

(1) Nominal Capacitance Value
(2) Nominal Capacitance Tolerance
(3) Rated Voltage
(4) Quantity
(5) Production Lot Number
(6) Manufacturer's Name
(7) Product Type Symbol

Lot Number Description
(Example)
0 1 0 1 2 3
- 0: Production Year
- 1: Production Month
- 0 1 2 3: Production Control Number

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12. Materials of Tape and Reel

(1) Reel (Shape and dimensions as per 2.3)
(2) Embossed Carrier (Shape and dimensions as per 2.1)
(3) Cover tape

13. Packaging

Capacitors must be packaged prior to shipment so as to prevent damage during transportation or storage. The period of storage at a normal room temperature and humidity is two years after production.

14. Inner Structure and Constituent Materials

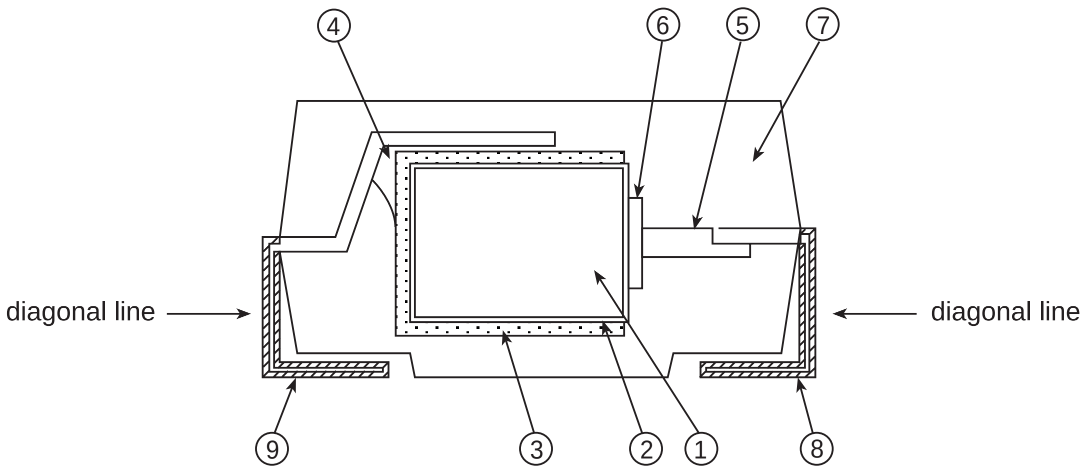

Table - 1

No.	Item	Material	Note
1	Element	Tantalum	
2	Electrolyte	Manganese oxide (MnO_2)	
3	Cathode layer	Carbon, Silver	
4	Conductive adhesive	Silver	
5	Anode lead wire	Tantalum	
6	Supporter	Teflon	
7	Mold resin	Epoxy	
8	Positive terminal	Nickel silver (0.1t)	Diagonal line: Sn90, Pb10 solder plating
9	Negative terminal	Nickel silver (0.1t)	

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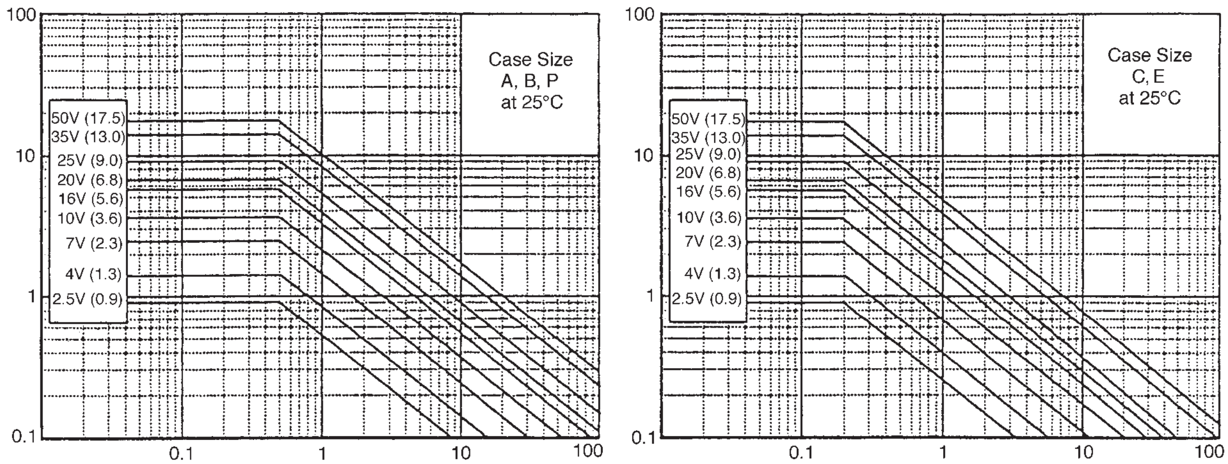
15. Handling cautions for use of TMC Type Tantalum Solid Electrolytic Capacitors

15.1 Ripple Voltage

A. Keep the sum of peak DC voltage and ripple voltage within the rated voltage and never go over it

B. When ripple voltage applied, use less value than shown below



Maximum Permissible Ripple Voltage (Vrms)   Frequency (kHz)

In case of high temperature use, calculate permissible ripple voltage by using the following formula:

Vrms (at 50°C) = 0.7 x Vrms (at 25°C)
Vrms (at 85°C) = 0.5 x Vrms (at 25°C)

15.2 Reverse Polarity Voltage

A. TMC Type Solid tantalium capacitors are polar and reverse polarity voltage must not be applied.
But, for short time application, the peak reverse polarity voltage applied to the capacitor must not exceed:
at 25°C - 10% of rated voltage or 1V, whichever is smaller.
at 85°C - 5% of rated voltage or 0.5V, whichever is smaller.

B. Careless contact of the tester to the capacitor will cause reverse polarity voltage and excessive voltage.

15.3 Voltage Derating

Have voltage derating ratio as large as possible. Especially, in case of low impedance circuit use, not more than 1/3 of rated voltage is recommended. For moment heavy current run like switching or pulse voltage. The value of resistor is recommended to be more than 3 ohms per volt. (Limit to less than 300mA for rush current).

15.4 Applications

A. Limit of Stress

Stress given to the capacitor by sucking tools and centering tweezers must not exceed 4.9N (stress time not more than 5 sec.) with the 1.5Ø point. Especially, the setting position of sucking tools is too low will cause not only overloading to the capacitor, but also wire - snapping on PC boards and scattering of capacitors and other parts, when consolidated mounting with other chip components of less than 1mm in height.

15.4 Applications *(continued)*

B. Recommended Soldering Pattern Dimensions

The recommended chip soldering pattern dimensions are as shown in Table 2 and Fig. 1. Note, however, that they are affected by such factors as reflow conditions, solder type, and circuit board size.
If the pattern area is significantly larger than the capacitor terminal area, the capacitor in place may be displaced when the solder melts.

Fig. 1 - Recommended soldering pattern dimensions

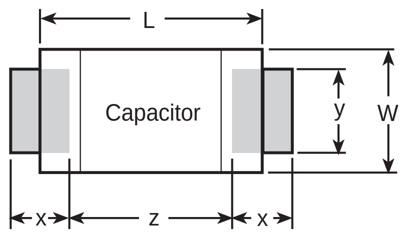


Table 2 - Recommended soldering pattern

Dimensions / Case size	Capacitor size		Pattern dimensions		
	L	W	x	y	z
P	2.0	1.25	1.2	1.1	0.8
A	3.2	1.6	1.6	1.2	1.2
B	3.5	2.8	1.6	2.2	1.4
C	5.8	3.2	2.3	2.4	2.4
E	7.3	4.3	2.3	2.6	3.8

C. Flux

Use login - family flux and avoid the use of strong acid and high activational materials.

D. Solderability

Carry out soldering under following conditions. We recommend soldering at a lower temperature and at a shorter time.

1) Soldering Iron
   Temperature at the point of soldering iron: Not higher than +350°C
   Soldering Time: Less than 3 seconds
   Output: Less than 30W
2) Reflow (Atomospheric and Hot - Plate)
   Capacitor Body Temperature: Not higher than +260°C
   Time: Not more than 10 seconds

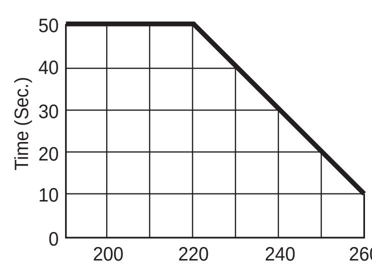


Fig. 2

A permissible range for peak temperature and time as per Fig. 2.

a) There is no problem in such a hot - plate heating method which will heat the bottom side, but in case of the top side heating by infra-red, the temperature of capacitor body becomes higher than the surface of PC boards. Caution must be taken.

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D. Solderability *(continued)*

b) In case of near infra-red heating with big power output, sudden temperature increase will occur and preheating at 130°C - 160°C for more than one minute is recommended. Please be sure that the temperature between maximum reflow temperature and the one used will remain less than 100°C

c) If solder land is bigger than the capacitor terminal, slipping off of the capacitor in its position will happen. Please take care that this does not happen.

3) Solder Immersion
Solder Bath Temperature: Not higher than 260°C
Time: A, B, P Cases: Not more than 10 seconds
C, E Cases: Not more than 5 seconds

A permissible range for peak temperature and time as per Fig. 3

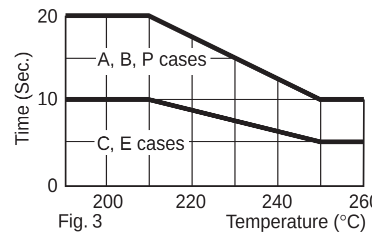

Fig. 3

a) Consideration must be taken to remove “gas” because solderability is sometimes bad for high density of components.

b) Pre-heat as much as possible and avoid sudden heating to the capacitor. Recommended pre-heat temp. is 130~160°C for more than one minute and the temperature between peak temp. and pre-heat is less than 100°C.

E. Cleaning

Allow board surface temperature to drop to normal temperature fully, after which cleaning shall be made. Usable solvent are as follows:

- Halogen system organic solvent (HCFC225, methylene chloride and the like.)
- Alcohol type solvent (IPA, ethylalcohol and the like.)
- Petroleum type solvent, alkaline saponification agent, water and the like.

Cleaning must me made under the following conditions.
Temperature: Not higher than +50°C
Immersion Time: Not more than 30 minutes

In case of ultrasonic cleaning, it must be made with a frequency of less than 45kHz, an output of less than 0.02W/cm^3 within 5 minutes at less than +40°C.

1) Ultrasonic cleaning should be avoided as much as possible, but when above cleaning is carried out, please see to it that mounted capacitors do not bump against other parts and no hard brush will be used to rub circuit boards.
2) Ultrasonic cleanings mentioned above are based on thyrister - inveter method. So, for cleanings with other methods, please carry out much of pre-tests.

F. Conductive Adhesive

The use of conductive adhesive for capacitor mounting should be avoided. Please consult KOA Speer for use if necessary.

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