

## Product Specification

Number: Chip Tantalum Capacitors

Series: L-KLS10-TCA

Customer: \_\_\_\_\_

Date: 2021-04-29

Customer Signature:



**NINGBO KLS ELECTRONIC CO; LTD**

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Compile	Check	Review	Approval
Jenny	May	Daniel	Kandy

<b>Product Name</b>	<b>CHIP TANTALUM CAP ACITORS</b>
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**1.Scope:**

This specification applies to CHIP TANTALUM CAPACITORS produced by our factory for use in electronic equipment.

**2.Performing Standard:**

《electronic component detailed standard TCA Surface Mounted Solid Capacitor Evaluation Standard E》 Q/TANCAP.45-02

**3.Testing Condition:**

Room Temperature 25℃, relative Humidity 60 to 70%, Air Pressure 800 to 1060mbar.

**4.Handling:**

It is mandatory to fully discharge capacitor to avoid failure test results.  
Product is polarity component, it is prohibited to connect positive poles and negative poles reversely to avoid product performance failure.

**5.Checking List:**

Item	Characteristics	Testing Method
Drawing and dimension	See table (4).	Measured with Gauge
Appearance	Complete Marking 、 Clear、 centered.	visual
Leakage current	Less than 0.01CV or 0.5μA ( whichever is greater )	Pressurize related voltage between two poles( Series connecting 1K current-limiting resistor) Read
Capacitance tolerance	±10% ( K ); ±20% ( M )	The measurement frequency: 100 ( 120 ) HZ Voltage: 0.3±0.02V

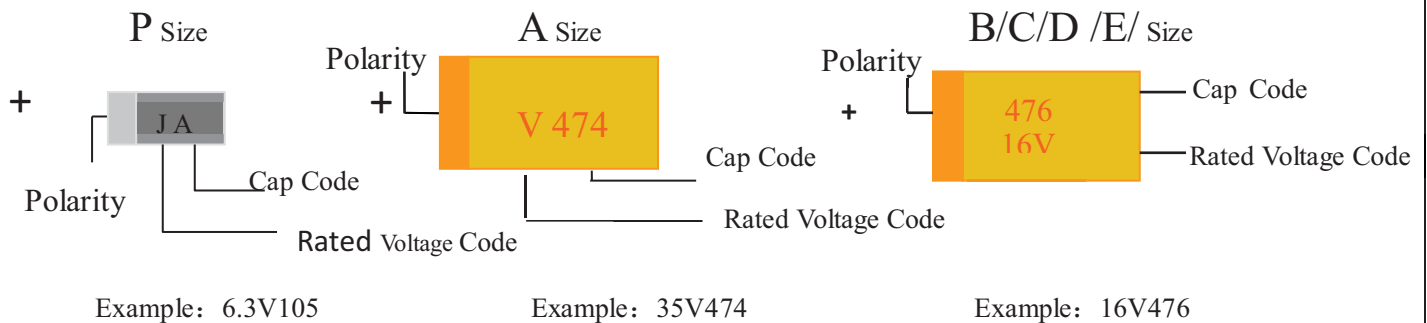
Item	Characteristics			Testing Method						
Dissipation factor ( $\text{tg}\delta$ )	See table (6).			The measurement frequency: 100 (120) HZ Voltage: $0.3\pm 0.02\text{V}$						
ESR	See table (6).			The measurement frequency: 100(120)KHZ						
Solderability	Soldering coverage rate $\geq 95\%$			Dip capacitor into flux for two seconds, then remove excessive amount of flux, dip capacitor into $245\pm 3^\circ\text{C}$ welding slot with 10mm depth for three seconds, withdraw capacitor, clean capacitor with proper amount of solution, use ten times the microscope to observe.						
Temperature Performance Table(1)	Capacitance ( $\mu\text{F}$ )	Change of capacitance (%)			Max D.F (%)				Max DCL( $\mu\text{A}$ )	
		-55 $^\circ\text{C}$	+85 $^\circ\text{C}$	+12 5 $^\circ\text{C}$	-55 $^\circ\text{C}$	+25 $^\circ\text{C}$	+85 $^\circ\text{C}$	+125 $^\circ\text{C}$	+85 $^\circ\text{C}$	+125 $^\circ\text{C}$
	$\leq 1.0$	-10	+10	+12	Below 1.5*(+25 $^\circ\text{C}$ value)	See table 6.	below 1.5*(+25 $^\circ\text{C}$ value)	$10 \cdot I_0$	$12.5 \cdot I_0$	
	1.5-68									
	100-220									
	330-470									
>470										

6.How To Order

1) Order Information:

L	-KLS10-TCA	-106	M	2.5V	-D
RoHS Compliance	Type Chip Tantalum Capacitors	Capacitance Code pF code: Table(5)	Tolerance K = ±10% M = ±20%	Rated DC Voltage 2.5V=2.5V dc 4V=4V dc 6.3V=6.3V dc 10V=10V dc 16V=16V dc 20V=20V dc 35V=35V dc 50V=50V dc Table(2)	Case Codec P:2.0*1.2 A:3.2*1.6 B:3.5*2.8 C:6.0*3.2 D:7.3*4.3 E:7.3*4.3 Table(4)

2)Product mark and code:



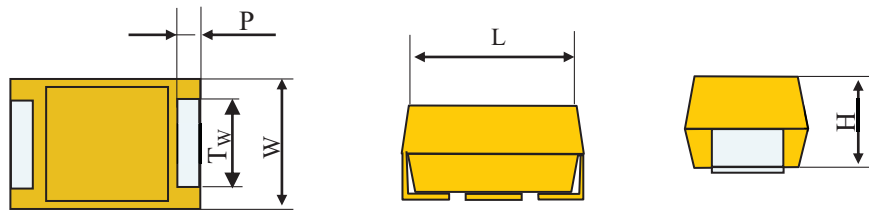
### Rated Voltage Code: Table(2)

Code	2.5V	4V	6.3V	10V	16V	20V	25V	35V	50V
Rated Voltage	2.5V	4V	6.3V	10V	16V	20V	25V	35V	50V

### (P Size)Capacitance code: Table(3)

Cap C <sub>R</sub> (uF)	Cap code	Cap C <sub>R</sub> (uF)	Cap code	Cap C <sub>R</sub> (uF)	Cap code	Cap C <sub>R</sub> (uF)	Cap code
0.1	<u>A</u>	0.47	<u>s</u>	2.2	J	10	<u>A</u>
0.15	<u>E</u>	0.68	<u>W</u>	3.3	N	15	<u>E</u>
0.22	<u>J</u>	1	A	4.7	S	22	<u>J</u>
0.33	<u>N</u>	1.5	E	6.8	W	33	<u>N</u>

### 3) Drawing And Dimension:



### Table(4)

CASE CODE	EIA/IECQ	L	W	H	P	T <sub>w</sub>
P	2012	2.0±0.2	1.2±0.2	1.2±0.2	0.5±0.3	1.2±0.1
A	3216	3.2±0.2	1.6±0.2	1.6±0.2	0.8±0.3	1.2±0.1
B	3528	3.5±0.2	2.8±0.2	1.9±0.2	0.8±0.3	2.2±0.1
C	6032	6.0±0.3	3.2±0.3	2.5±0.3	1.3±0.3	2.2±0.1
D	7343	7.3±0.3	4.3±0.3	2.8±0.3	1.3±0.3	2.4±0.1
E	7343	7.3±0.3	4.3±0.3	4.0±0.3	1.3±0.3	2.4±0.1

## 7.Product electrical performance Parameters corresponding table

### 1 ) Capacitor case sizes of rated voltage Table(5)

VR ≤+85°C	2.5(e)	4(G)	6.3(J)	10(A)	16(C)	20(D)	25(E)	35(V)	50(T)	
VC ≤+125°C	1.7	2.5	4	6.3	10	13	16	23	33	
VS ≤+85°C	3.2	5	8	13	20	26	32	46	60	
VR ≤+125°C	2.2	3.4	5	8	12	16	20	26	38	
Temperature range: -55°C~+125°C										
Cap (uF)	C <sub>R</sub>	Cap code	Case size							
0.1	1 4						P		A	A
0.15	154						P		A	A/B
0.22	224						P		A	A/B
0.33	334						P	A	A	A/B
0.47	474					P	P	A	A/B	A/B/C
0.68	684				P	P	P/A	A	A/B	A/B/C
1.0	105			P	P	P/A	A	A/B	A/B	B/C
1.5	155		P	P	P/A	P/A	A/B	A/B	A/B/C	C/D
2.2	225		P	P/A	P/A/B	A/B	A/B	A/B/C	B/C	C/D
3.3	335		P/A	P/A	P/A/B	A/B	A/B/C	A/B/C	B/C	C/D
4.7	475		P/A	P/A	P/A/B	A/B	A/B/C	A/B/C	C/D	C/D
6.8	685		P/A	P/A/B	P/A/B	A/B/C	A/B/C	B/C/D	C/D	D/E
10	106		A/B	P/A/B	A/B/C/P	A/B/C	B/C/D	B/C/D	C/D/E	D/E
15	156		A/B	P/A/B/C	A/B/C	A/B/C	B/C/D	C/D	D/E	E
22	226		A/B/C	P/A/B/C	A/B/C/	B/C/D	B/C/D	C/D	D/E	
33	336	A	A/B/C	A/B/C	A/B/C/D	B/C/D	C/D	D/E	E	
47	476	A	A/B/C	A/B/C/D	A/B/C/D	C/D	D/E	D/E	E	
68	686	A	A/B/C/D	A/B/C/D	B/C/D	C/D/E	D/E	E		
100	107	B	A/B/C/D	A/B/C/D	B/C/D	D/E	D/E	E		
150	157	B	B/C/D	B/C/D/E	C/D/E	D/E	E			
220	227	B/C	B/C/D	B//C/D/E	D/E	E				
330	337	B/C/D	C/D/E	/D/E	D/E	E				
470	477	C/D	C/D/E	D/E	E					
680	687	D/E	D/E	D/E						
1000	108	D/E								

**Product Name**    **CHIP TANTALUM CAPACITORS**

**2)Refer to number electrical specification Table(6)**

$U_R$ (V)	Case Size	$C_R$ (uF)	DCL (uA) Max.	DF (%) Max.	ES ( $\Omega$ ) Max. 100kHz	TANCAP Part number
<b>2.5V at 85° C (Category Voltage 1.7V at 125° C)</b>						
2.5	A	33	0.8	6	3	L-KLS10-TCA-336K2.5V-A
2.5	A	47	1.2	6	3	L-KLS10-TCA-476K2.5V-A
2.5	A	68	1.	6	1.5	L-KLS10-TCA-686K2.5V-A
2.5	B	100	2.5	8	1.4	L-KLS10-TCA-107K2.5V-B
2.5	B	150	3.8	8	1.6	L-KLS10-TCA-157K2.5V-B
2.5	B	220	5.5	8	1.6	L-KLS10-TCA-227K2.5V-B
2.5	C	220	5.5	8	0.9	L-KLS10-TCA-227K2.5V-C
2.5	B	330	8.3	12	1.6	L-KLS10-TCA-337K2.5V-B
2.5	C	330	8.3	12	0.9	L-KLS10-TCA-337K2.5V-C
2.5	D	330	8.3	12	0.9	L-KLS10-TCA-337K2.5V-D
2.5	C	470	11.8	12	0.9	L-KLS10-TCA-477K2.5V-C
2.5	D	470	11.8	12	0.9	L-KLS10-TCA-477K2.5V-D
2.5	D	680	17	14	0.9	L-KLS10-TCA-687K2.5V-D
2.5	E	680	17	14	0.5	L-KLS10-TCA-687K2.5V-E
2.5	D	1000	25	14	0.5	L-KLS10-TCA-108K2.5V-D
2.5	E	1000	25	14	0.5	L-KLS10-TCA-108K2.5V-E
<b>4.0V at 85° C (Category Voltage 2.5V at 125° C)</b>						
4	P	1.5	0.5	6	20	L-KLS10-TCA-155K4V-P
4	P	2.2	0.5	6	18	L-KLS10-TCA-225K4V-P
4	P	3.3	0.5	6	15	L-KLS10-TCA-335K4V-P
4	P	4.7	0.5	6	12	L-KLS10-TCA-475K4V-P
4	P	6.8	0.5	6	10	L-KLS10-TCA-685K4V-P
4	A	3.3	0.5	6	8	L-KLS10-TCA-335K4V-A
4	A	4.7	0.5	6	8	L-KLS10-TCA-475K4V-A
4	A	6.8	0.5	6	6	L-KLS10-TCA-685K4V-A
4	A	10	0.5	6	6	L-KLS10-TCA-106K4V-A
4	B	10	0.5	6	3.5	L-KLS10-TCA-106K4V-B
4	A	15	0.6	6	4	L-KLS10-TCA-156K4V-A
4	B	15	0.6	6	3.5	L-KLS10-TCA-156K4V-B
4	A	22	0.9	6	4	L-KLS10-TCA-226K4V-A
4	B	22	0.9	6	3.5	L-KLS10-TCA-226K4V-B
4	C	22	0.9	6	1.8	L-KLS10-TCA-226K4V-C
4	A	33	1.3	6	4	L-KLS10-TCA-336K4V-A
4	B	33	1.3	6	3.5	L-KLS10-TCA-336K4V-B
4	C	33	1.3	6	1.8	L-KLS10-TCA-336K4V-C
4	A	47	1.9	6	3	L-KLS10-TCA-476K4V-A

<b>Product Name</b>	<b>CHIP TANTALUM CAPACITORS</b>
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U <sub>r</sub> (V)	Case Size	C <sub>R</sub> (uF)	DCL (uA) Max.	DF (%) Max.	ESR (Ω) Max. 100kHz	TANCAP Part number
<b>4.0V at 85° C (Category Voltage 2.5V at 125° C)</b>						
4	B	47	1.9	6	2.5	L-KLS10-TCA-476K4V-B
4	C	47	1.9	6	1.8	L-KLS10-TCA-476K4V-C
4	A	68	2.7	18	2.5	L-KLS10-TCA-686K4V-A
4	B	68	2.7	6	1.8	L-KLS10-TCA-686K4V-B
4	C	68	2.7	6	1.6	L-KLS10-TCA-686K4V-C
4	D	68	2.7	6	0.8	L-KLS10-TCA-686K4V-D
4	A#	100	4	20	2.0	L-KLS10-TCA-107K4V-A
4	B*	100	4	8	1.8	L-KLS10-TCA-107K4V-B
4	C	100	4	8	1.2	L-KLS10-TCA-107K4V-C
4	D	100	4	8	0.8	L-KLS10-TCA-107K4V-D
4	B*	150	6	15	2.0	L-KLS10-TCA-157K4V-B
4	C	150	6	8	1.2	L-KLS10-TCA-157K4V-C
4	D	150	6	8	1.2	L-KLS10-TCA-157K4V-D
4	B#	220	8.8	18	2.0	L-KLS10-TCA-227K4V-B
4	C	220	8.8	8	1.2	L-KLS10-TCA-227K4V-C
4	D	220	8.8	8	0.9	L-KLS10-TCA-227K4V-D
4	C	330	13.2	12	0.9	L-KLS10-TCA-337K4V-C
4	D	330	13.2	12	0.9	L-KLS10-TCA-337K4V-D
4	E	330	13.2	12	0.9	L-KLS10-TCA-377K4V-E
4	C	470	18.8	12	0.9	L-KLS10-TCA-477K4V-C
4	D	470	18.8	12	0.9	L-KLS10-TCA-477K4V-D
4	E	470	18.8	12	0.5	L-KLS10-TCA-477K4V-E
4	D#	680	27.2	14	0.5	L-KLS10-TCA-687K4V-D
4	E#	680	27.2	14	0.5	L-KLS10-TCA-687K4V-E
<b>6.3V at 85° C (Category Voltage 4.0V at 125° C)</b>						
6.3	P	1	0.5	6	25	L-KLS10-TCA-105K6.3V-P
6.3	P	1.5	0.5	6	10	L-KLS10-TCA-155K6.3V-P
6.3	P	2.2	0.5	6	20	L-KLS10-TCA-225K6.3V-P
6.3	A	2.2	0.5	6	8	L-KLS10-TCA-225K6.3V-A
6.3	P	3.3	0.5	6	10	L-KLS10-TCA-335K6.3V-P
6.3	A	3.3	0.5	6	8	L-KLS10-TCA-335K6.3V-A
6.3	P	4.7	0.5	6	7	L-KLS10-TCA-475K6.3V-P
6.3	A	4.7	0.5	6	6	L-KLS10-TCA-475K6.3V-A
6.3	P	6.8	0.5	8	6	L-KLS10-TCA-685K6.3V-P
6.3	A	6.8	0.5	6	6	L-KLS10-TCA-685K6.3V-A



**Product Name      CHIP TANTALUM CAPACITORS**

U <sub>R</sub> (V)	Case Size	CR (uF)	DCL (uA) Max.	DF (%) Max.	ESR (Ω) Max. 100kHz	TANCAP Part number
<b>6.3V at 85° C (Category Voltage 4.0V at 125° C)</b>						
6.3	B	6.8	0.5	6	3.5	L-KLS10-TCA-685K6.3V-B
6.3	P	10	0.6	6	8	L-KLS10-TCA-106K6.3V-P
6.3	A	10	0.6	6	4	L-KLS10-TCA-106K6.3V-A
6.3	B	10	0.6	6	3.5	L-KLS10-TCA-106K6.3V-b
6.3	P	15	0.9	12	5	L-KLS10-TCA-156K6.3V-P
6.3	A	15	0.9	6	3.5	L-KLS10-TCA-156K6.3V-A
6.3	B	15	0.9	6	3.5	L-KLS10-TCA-156K6.3V-B
6.3	C	15	0.9	6	1.8	L-KLS10-TCA-156K6.3V-C
6.3	P	22	1.4	18	10	L-KLS10-TCA-226K6.3V-P
6.3	A	22	1.4	6	4	L-KLS10-TCA-226K6.3V-A
6.3	B	22	1.4	6	3.5	L-KLS10-TCA-226K6.3V-B
6.3	C	22	1.4	6	1.8	L-KLS10-TCA-226K6.3V-C
6.3	A	33	2.1	8	3.0	L-KLS10-TCA-336K6.3V-A
6.3	B	33	2.1	6	2.5	L-KLS10-TCA-336K6.3V-B
6.3	C	33	2.1	6	1.8	L-KLS10-TCA-336K6.3V-C
6.3	A	47	4	10	3.5	L-KLS10-TCA-476K6.3V-A
6.3	B	47	4	6	2	L-KLS10-TCA-476K6.3V-B
6.3	C	47	4	6	1.6	L-KLS10-TCA-476K6.3V-C
6.3	D	47	4	6	0.8	L-KLS10-TCA-476K6.3V-D
6.3	A#	68	4.3	16	2.0	L-KLS10-TCA-686K6.3V-A
6.3	B	68	4.3	10	0.9	L-KLS10-TCA-686K6.3V-B
6.3	C	68	4.3	6	1.2	L-KLS10-TCA-686K6.3V-C
6.3	D	68	4.3	6	0.8	L-KLS10-TCA-686K6.3V-D
6.3	A#	100	6.3	30	4.0	L-KLS10-TCA-107K6.3V-A
6.3	B*	100	6.3	10	3	L-KLS10-TCA-107K6.3V-B
6.3	C	100	6.3	8	0.9	L-KLS10-TCA-107K6.3V-C
6.3	D	100	6.3	8	0.8	L-KLS10-TCA-107K6.3V-D
6.3	B#	150	9.5	15	1.5	L-KLS10-TCA-157K6.3V-B
6.3	C	150	9.5	10	1.2	L-KLS10-TCA-157K6.3V-C
6.3	D	150	9.5	8	0.9	L-KLS10-TCA-157K6.3V-D
6.3	E	150	9.5	8	0.5	L-KLS10-TCA-157K6.3V-E
6.3	B	220	13.9	18	1.0	L-KLS10-TCA-227K6.3V-B
6.3	C	220	13.9	8	0.9	L-KLS10-TCA-227K6.3V-C
6.3	D	220	13.9	8	0.9	L-KLS10-TCA-227K6.3V-D
6.3	E	220	13.9	8	0.9	L-KLS10-TCA-227K6.3V-E
6.3	D	330	20.8	8	0.9	L-KLS10-TCA-337K6.3V-D

<b>Product Name</b>	<b>CHIP TANTALUM CAPACITORS</b>
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$U_R$ (V)	Case Size	$C_R$ (uF)	DCL (uA) Max.	DF (%) Max.	ESR ( $\Omega$ ) Max. 100kHz	TANCAP Part number
<b>6.3V at 85° C (Category Voltage 4.0V at 125° C)</b>						
6.3	E	330	20.8	12	0.9	L-KLS10-TCA-337K6.3V-E
6.3	D*	470	29.6	12	0.4	L-KLS10-TCA-477K6.3V-D
6.3	E*	470	29.6	12	0.4	L-KLS10-TCA-477K6.3V-E
6.3	D#	680	42.8	14	0.5	L-KLS10-TCA-687K6.3V-D
6.3	E#	680	42.8	14	0.5	L-KLS10-TCA-687K6.3V-E
<b>10V at 85° C (Category Voltage 6.3V at 125° C)</b>						
10	P	0.68	0.5	4	28	L-KLS10-TCA-684K10V-P
10	P	1	0.5	4	25	L-KLS10-TCA-105K10V-P
10	P	1.5	0.5	6	15	L-KLS10-TCA-155K10V-P
10	A	1.5	0.5	6	8	L-KLS10-TCA-155K10V-A
10	P	2.2	0.5	6	10	L-KLS10-TCA-255K10V-P
10	A	2.2	0.5	6	8	L-KLS10-TCA-255K10V-A
10	B	2.2	0.5	6	3.5	L-KLS10-TCA-255K10V-B
10	P	3.3	0.5	8	10	L-KLS10-TCA-335K10V-P
10	A	3.3	0.5	6	6	L-KLS10-TCA-335K10V-A
10	B	3.3	0.5	6	5	L-KLS10-TCA-335K10V-B
10	P	4.7	0.5	8	6	L-KLS10-TCA-475K10V-P
10	A	4.7	0.5	6	5	L-KLS10-TCA-475K10V-A
10	B	4.7	0.5	6	3.5	L-KLS10-TCA-475K10V-B
10	A	6.8	0.7	6	4	L-KLS10-TCA-685K10V-A
10	P	6.8	0.7	8	6	L-KLS10-TCA-685K10V-P
10	B	6.8	0.7	6	3.5	L-KLS10-TCA-685K10V-B
10	P	10	1	14	6	L-KLS10-TCA-106K10V-P
10	A	10	1	6	4	L-KLS10-TCA-106K10V-A
10	B	10	1	6	3.5	L-KLS10-TCA-106K10V-B
10	C	10	1	6	1.8	L-KLS10-TCA-106K10V-C
10	A	15	1.5	6	6	L-KLS10-TCA-156K10V-A
10	B	15	1.5	6	2.8	L-KLS10-TCA-156K10V-B
10	C	15	1.5	6	1.8	L-KLS10-TCA-156K10V-C
10	A	22	2.2	8	6	L-KLS10-TCA-226K10V-A
10	B	22	2.2	6	2.4	L-KLS10-TCA-226K10V-B
10	C	22	2.2	6	1.8	L-KLS10-TCA-226K10V-C
10	A#	33	3.3	15	3.0	L-KLS10-TCA-336K10V-A
10	B	33	3.3	6	1.8	L-KLS10-TCA-336K10V-B

<b>Product Name</b>	<b>CHIP TANTALUM CAPACITORS</b>
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U <sub>R</sub> (V)	Case Size	C <sub>R</sub> (uF)	DCL (uA) Max.	DF (%) Max.	ESR (Ω) Max. 100kHz	TANCAP Part number
<b>10V at 85° C (Category Voltage 6.3V at 125° C)</b>						
10	C	33	3.3	6	1.6	L-KLS10-TCA-336K10V-C
10	D	33	3.3	6	0.8	L-KLS10-TCA-336K10V-D
10	A	47	4.7	15	2.5	L-KLS10-TCA-476K10V-A
10	B	47	4.7	8	1	L-KLS10-TCA-476K10V-B
10	C	47	4.7	6	1.2	L-KLS10-TCA-476K10V-C
10	D	47	4.7	6	0.8	L-KLS10-TCA-476K10V-D
10	B #	68	6.8	10	3	L-KLS10-TCA-686K10V-B
10	C	68	6.8	6	1.2	L-KLS10-TCA-686K10V-C
10	D	68	6.8	6	0.8	L-KLS10-TCA-686K10V-D
10	C	100	10	8	1.2	L-KLS10-TCA-107K10V-C
10	B#	100	10	15	1.2	L-KLS10-TCA-107K10V-B
10	D	100	10	8	0.9	L-KLS10-TCA-107K10V-D
10	C #	150	15	10	1.5	L-KLS10-TCA-157K10V-C
10	D	150	15	8	0.9	L-KLS10-TCA-157K10V-D
10	E	150	15	8	0.9	L-KLS10-TCA-157K10V-E
10	D	220	22	8	0.5	L-KLS10-TCA-227K10V-D
10	E	220	22	8	0.5	L-KLS10-TCA-227K10V-E
10	D*	330	33	12	0.5	L-KLS10-TCA-337K10V-B
10	E*	330	33	12	0.5	L-KLS10-TCA-337K10V-E
10	E*	470	47	12	0.5	L-KLS10-TCA-477K10V-E
<b>16V at 85° C (Category Voltage 10V at 125° C)</b>						
16	P	0.47	0.5	4	25	L-KLS10-TCA-474K16V-P
16	P	0.68	0.5	4	25	L-KLS10-TCA-684K16V-P
16	P	1	0.5	4	20	L-KLS10-TCA-105K16V-P
16	A	1	0.5	4	11	L-KLS10-TCA-105K16V-A
16	P	1.5	0.5	6	20	L-KLS10-TCA-155K16V-P
16	A	1.5	0.5	6	8	L-KLS10-TCA-155K16V-A
16	A	2.2	0.	6	6	L-KLS10-TCA-255K16V-A
16	B	2.2	0.5	6	4.6	L-KLS10-TCA-255K16V-B
16	A	3.3	0.5	6	5	L-KLS10-TCA-335K16V-A
16	B	3.3	0.5	6	3.5	L-KLS10-TCA-335K16V-B
16	A	4.7	0.8	6	4	L-KLS10-TCA-475K16V-A
16	B	4.7	0.8	6	3.5	L-KLS10-TCA-475K16V-B

<b>Product Name</b>	<b>CHIP TANTALUM CAPACITORS</b>
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U <sub>R</sub> (V)	Case Size	C <sub>R</sub> (uF)	DCL (uA) Max.	DF (%) Max.	ESR (Ω) Max. 100kHz	TANCAP Part number
<b>16V at 85° C (Category Voltage 10V at 125° C )</b>						
16	B	6.8	1.1	6	2.5	L-KLS10-TCA-685K16V-B
16	A	6.8	1.1	6	3.5	L-KLS10-TCA-685K16V-A
16	C	6.8	1.1	6	1.9	L-KLS10-TCA-685K16V-C
16	A*	10	1.6	8	3.2	L-KLS10-TCA-106K16V-A
16	B	10	1.6	6	2.8	L-KLS10-TCA-106K16V-B
16	C	10	1.6	6	2	L-KLS10-TCA-106K16V-C
16	A#	15	2.4	10	3.5	L-KLS10-TCA-156K16V-A
16	B	15	2.4	6	2.5	L-KLS10-TCA-156K16V-B
16	C	15	2.4	6	1.8	L-KLS10-TCA-156K16V-C
16	B	22	3.5	6	2.2	L-KLS10-TCA-226K16V-B
16	C	22	3.5	6	1.6	L-KLS10-TCA-226K16V-C
16	D	22	3.5	6	1.1	L-KLS10-TCA-226K16V-D
16	B*	33	5.3	8	2.1	L-KLS10-TCA-336K16V-B
16	C	33	5.3	6	1.5	L-KLS10-TCA-336K16V-C
16	D	33	5.3	6	0.9	L-KLS10-TCA-336K16V-D
16	C	47	7.5	6	1.4	L-KLS10-TCA-476K16V-C
16	D	47	7.5	6	0.9	L-KLS10-TCA-476K16V-D
16	C	68	10.9	6	1.3	L-KLS10-TCA-686K16V-C
16	D	68	10.9	6	0.9	L-KLS10-TCA-686K16V-D
16	C	100	16	8	1.2	L-KLS10-TCA-107K16V-C
16	D	100	16	8	0.9	L-KLS10-TCA-107K16V-D
16	E	100	16	8	0.9	L-KLS10-TCA-107K16V-E
16	D*	150	24	12	0.9	L-KLS10-TCA-157K16V-D
16	E*	150	24	10	0.5	L-KLS10-TCA-157K16V-E
16	E*	150	24	10	0.5	L-KLS10-TCA-157K16V-E
16	E#	220	35.2	10	0.5	L-KLS10-TCA-227K16V-E
<b>20V at 85° C (Category Voltage 13V at 125° C )</b>						
20	P	0.1	0.5	4	25	L-KLS10-TCA-104K20V-P
20	P	0.15	0.5	4	25	L-KLS10-TCA-157K20V-P
20	P	0.22	0.5	4	25	L-KLS10-TCA-224K20V-P
20	P	0.33	0.5	4	25	L-KLS10-TCA-334K20V-P
20	P	0.47	0.5	4	25	L-KLS10-TCA-474K20V-P
20	P	0.68	0.5	4	25	L-KLS10-TCA-684K20V-P
20	A	0.68	0.5	4	12	L-KLS10-TCA-684K20V-A

<b>Product Name</b>	<b>CHIP TANTALUM CAPACITORS</b>
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$U_R$ (V)	Case Size	$C_R$ (uF)	DCL (uA) Max.	DF (%) Max.	ESR ( $\Omega$ ) Max. 100kHz	TANCAP Part number
<b>20V at 85° C (Category Voltage 13V at 125° C)</b>						
20	A	1	0.5	4	9	L-KLS10-TCA-105K20V-A
20	A	1.5	0.5	6	6.5	L-KLS10-TCA-155K20V-A
20	B	1.5	0.5	6	5	L-KLS10-TCA-155K20V-B
20	A	2.2	0.5	6	7	L-KLS10-TCA-225K20V-A
20	B	2.2	0.5	6	3.5	L-KLS10-TCA-225K20V-B
20	A	3.3	0.7	6	4.5	L-KLS10-TCA-335K20V-A
20	B	3.3	0.7	6	3	L-KLS10-TCA-335K20V-B
20	C	3.3	0.7	6	2.5	L-KLS10-TCA-335K20V-C
20	A	4.7	0.9	6	4	L-KLS10-TCA-475K20V-A
20	C	4.7	0.9	6	2.4	L-KLS10-TCA-475K20V-C
20	B	4.7	0.9	6	3	L-KLS10-TCA-475K20V-B
20	A	6.8	1.4	6	6	L-KLS10-TCA-685K20V-A
20	B	6.8	1.4	6	2.5	L-KLS10-TCA-685K20V-B
20	C	6.8	1.4	6	2	L-KLS10-TCA-685K20V-C
20	B	10	2	6	2.1	L-KLS10-TCA-106K20V-B
20	C	10	2	6	1.8	L-KLS10-TCA-106K20V-C
20	D	10	2	6	1.3	L-KLS10-TCA-106K20V-D
20	B	15	3	6	2	L-KLS10-TCA-156K20V-B
20	C	15	3	6	1.7	L-KLS10-TCA-156K20V-C
20	D	15	3	6	1	L-KLS10-TCA-156K20V-D
20	B #	22	4.4	8	2.5	L-KLS10-TCA-226K20V-B
20	C	22	4.4	6	1.6	L-KLS10-TCA-226K20V-C
20	D	22	4.4	6	0.9	L-KLS10-TCA-226K20V-D
20	C	33	6.6	6	1.5	L-KLS10-TCA-336K20V-C
20	D	33	6.6	6	0.9	L-KLS10-TCA-336K20V-D
20	D	47	9.4	6	0.9	L-KLS10-TCA-476K20V-D
20	E	47	9.4	6	0.9	L-KLS10-TCA-476K20V-E
20	D *	68	13.6	6	0.9	L-KLS10-TCA-686K20V-D
20	E	68	13.6	6	0.9	L-KLS10-TCA-686K20V-E
20	D *	100	20	8	0.9	L-KLS10-TCA-107K20V-D
20	E *	100	20	8	0.5	L-KLS10-TCA-107K20V-E
20	E *	150	30	8	0.5	L-KLS10-TCA-157K20V-E

**Product Name**      **CHIP TANTALUM CAPACITORS**

U <sub>R</sub> (V)	Case Size	C <sub>R</sub> (uF)	DCL (uA) Max.	DF (%) Max.	ESR (Ω) Max. 100kHz	TANCAP Part number
<b>25V at 85° C (Category Voltage 16V at 125° C )</b>						
25	A	0.33	0.5	4	15	L-KLS10-TCA-334K25V-A
25	A	0.47	0.5	4	14	L-KLS10-TCA-474K25V-A
25	A	0.68	0.5	4	10	L-KLS10-TCA-684K25V-A
25	A	1	0.5	4	8	L-KLS10-TCA-105K25V-A
25	B	1	0.5	4	5	L-KLS10-TCA-105K25V-B
25	A	1.5	0.5	6	7.5	L-KLS10-TCA-155K25V-A
25	B	1.5	0.5	6	5	L-KLS10-TCA-155K25V-B
25	A	2.2	0.6	6	7	L-KLS10-TCA-225K25V-A
25	B	2.2	0.6	6	4.5	L-KLS10-TCA-225K25V-B
25	C	2.2	0.6	6	3.5	L-KLS10-TCA-225K25V-C
25	A	3.3	0.8	6	4.5	L-KLS10-TCA-335K25V-A
25	B	3.3	0.8	6	3.5	L-KLS10-TCA-335K25V-B
25	A#	4.7	1.2	8	2.5	L-KLS10-TCA-475K25V-A
25	B	4.7	1.2	6	2.8	L-KLS10-TCA-475K25V-B
25	C	4.7	1.2	6	2.4	L-KLS10-TCA-475K25V-C
25	B	6.8	1.7	6	2.8	L-KLS10-TCA-685K25V-B
25	C	6.8	1.7	6	2	L-KLS10-TCA-685K25V-C
25	D	6.8	1.7	6	1.4	L-KLS10-TCA-685K25V-D
25	B	10	2.5	8	3	L-KLS10-TCA-106K25V-B
25	C	10	2.5	6	1.8	L-KLS10-TCA-106K25V-C
25	D	10	2.5	6	1.2	L-KLS10-TCA-106K25V-D
25	C	15	3.8	6	1.6	L-KLS10-TCA-156K25V-C
25	D	15	3.8	6	1	L-KLS10-TCA-156K25V-D
25	C	22	5.5	6	1.4	L-KLS10-TCA-226K25V-C
25	D	22	5.5	6	0.9	L-KLS10-TCA-226K25V-D
25	D	33	8.3	6	0.9	L-KLS10-TCA-336K25V-D
25	E	33	8.3	6	0.9	L-KLS10-TCA-336K25V-E
25	D*	47	11.8	6	0.9	L-KLS10-TCA-476K25V-D
25	E*	47	11.8	6	0.9	L-KLS10-TCA-476K25V-E

<b>Product Name</b>	<b>CHIP TANTALUM CAPACITORS</b>
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U <sub>R</sub> (V)	Case Size	C <sub>R</sub> (uF)	DCL (uA) Max.	DF (%) Max.	ESR (Ω) Max. 100kHz	TANCAP Part number
<b>25V at 85° C (Category Voltage 16V at 125° C)</b>						
25	E *	68	18	6	0.9	L-KLS10-TCA-686K25V-E
25	E *	100	25	10	0.6	L-KLS10-TCA-107K25V-E
<b>35V at 85° C (Category Voltage 23V at 125° C)</b>						
35	A	0.1	0.5	4	24	L-KLS10-TCA-104K35V-A
35	A	0.15	0.5	4	21	L-KLS10-TCA-154K35V-A
35	A	0.22	0.5	4	18	L-KLS10-TCA-224K35V-A
35	A	0.33	0.5	4	15	L-KLS10-TCA-334K35V-A
35	A	0.47	0.5	4	12	L-KLS10-TCA-474K35V-A
35	B	0.47	0.5	4	10	L-KLS10-TCA-474K35V-B
35	A	0.68	0.5	4	8	L-KLS10-TCA-684K35V-A
35	B	0.68	0.5	4	8	L-KLS10-TCA-684K35V-B
35	A	1	0.5	4	7.5	L-KLS10-TCA-105K35V-A
35	B	1	0.5	4	6.5	L-KLS10-TCA-105K35V-B
35	A	1.5	0.5	6	7.5	L-KLS10-TCA-155K35V-A
35	B	1.5	0.5	6	5.2	L-KLS10-TCA-155K35V-B
35	C	1.5	0.5	6	4.5	L-KLS10-TCA-155K35V-C
35	B	2.2	0.8	6	4.2	L-KLS10-TCA-225K35V-B
35	C	2.2	0.8	6	3.5	L-KLS10-TCA-225K35V-C
35	B	3.3	1.2	6	3.5	L-KLS10-TCA-335K35V-B
35	C	3.3	1.2	6	2.5	L-KLS10-TCA-335K35V-C
35	C	4.7	1.6	6	1.5	L-KLS10-TCA-475K35V-C
35	D	4.7	1.6	6	1.5	L-KLS10-TCA-475K35V-D
35	C	6.8	2.4	6	1.8	L-KLS10-TCA-685K35V-C
35	D	6.8	2.4	6	1.3	L-KLS10-TCA-685K35V-D
35	C	10	3.5	6	1.6	L-KLS10-TCA-106K35V-C
35	D	10	3.5	6	1	L-KLS10-TCA-106K35V-D
35	E	10	3.5	6	0.9	L-KLS10-TCA-106K35V-E
35	D	15	5.3	6	0.9	L-KLS10-TCA-156K35V-D
35	E	15	5.3	6	0.8	L-KLS10-TCA-156K35V-E
35	D	22	7.7	6	0.9	L-KLS10-TCA-226K35V-D
35	E	22	7.7	6	0.7	L-KLS10-TCA-226K35V-E
35	E	33	11.6	6	0.6	L-KLS10-TCA-336K35V-E
35	E	47	16.5	8	0.6	L-KLS10-TCA-476K35V-E

$U_R$ (V)	Case Size	$C_R$ (uF)	DCL (uA) Max.	DF (%) Max.	ESR ( $\Omega$ ) Max. 100kHz	TANCAP Part number
<b>50V at 85° C (Category Voltage 33V at 125° C )</b>						
50	A	0.1	0.5	4	22	L-KLS10-TCA-104K50V-A
50	A	0.15	0.5	4	15	L-KLS10-TCA-1504K50V-A
50	B	0.15	0.5	4	16	L-KLS10-TCA-154K50V-B
50	A	0.22	0.5	4	18	L-KLS10-TCA-224K50V-A
50	B	0.22	0.5	4	14	L-KLS10-TCA-224K50V-B
50	A	0.33	0.5	4	12	L-KLS10-TCA-334K50V-A
50	B	0.33	0.5	4	12	L-KLS10-TCA-334K50V-B
50	A	0.47	0.5	4	9.5	L-KLS10-TCA-474K50V-A
50	B	0.47	0.5	4	9.5	L-KLS10-TCA-474K50V-B
50	C	0.47	0.5	4	8	L-KLS10-TCA-474K50V-C
50	A	0.68	0.5	4	8	L-KLS10-TCA-684K50V-A
50	B	0.68	0.5	4	8	L-KLS10-TCA-684K50V-B
50	C	0.68	0.5	4	7	L-KLS10-TCA-684K50V-C
50	B	1	0.5	6	7	L-KLS10-TCA-105K50V-B
50	C	1	0.5	4	5.5	L-KLS10-TCA-105K50V-C
50	C	1.5	0.8	6	4.5	L-KLS10-TCA-155K50V-C
50	D	1.5	0.8	6	4	L-KLS10-TCA-155K50V-D
50	C	2.2	1.1	6	3	L-KLS10-TCA-225K50V-C
50	D	2.2	1.1	6	2.5	L-KLS10-TCA-225K50V-D
50	C	3.3	1.7	6	2.5	L-KLS10-TCA-335K50V-C
50	D	3.3	1.7	6	2	L-KLS10-TCA-335K50V-D
50	C	4.7	2.4	6	1.4	L-KLS10-TCA-475K50V-C
50	D	4.7	2.4	6	1.4	L-KLS10-TCA-475K50V-D
50	D	10	5	6	0.8	L-KLS10-TCA-106K50V-D
50	E	10	5	6	0.7	L-KLS10-TCA-106K50V-E
50	E	15	7.5	6	0.7	L-KLS10-TCA-156K50V-E

**Remark:**

- All technical data measured at 25 °C.
- Capacitance and loss test conditions:  $U = 1.7 \sim 2.2V$ ,  $U_{\text{partial}} = 0 \sim 1V$  (RMS), the measurement frequency: 100(120)HZ
- The leakage current should be measured after 5 minutes application of rated voltage should +125 °C with voltage derating.

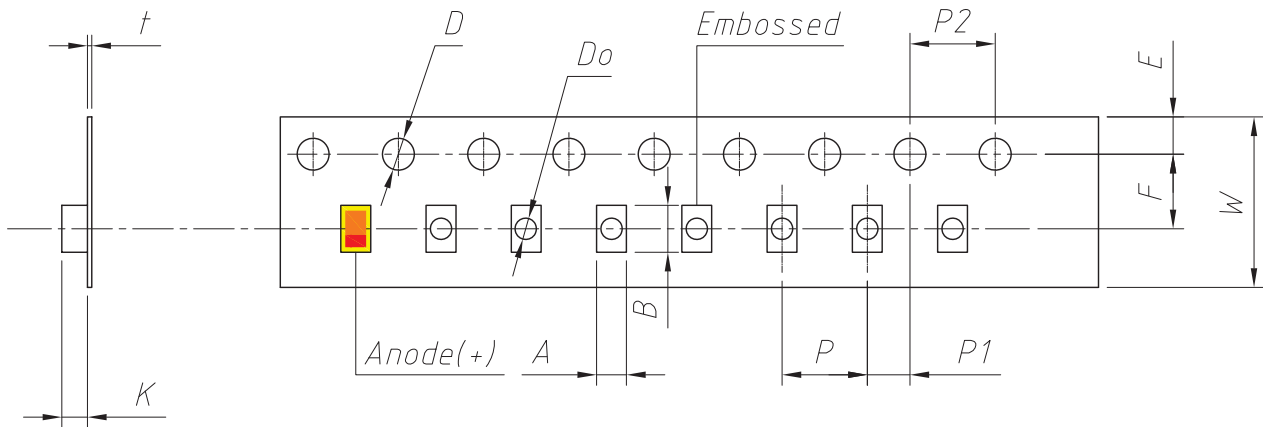
**Note:**

- 1) "\*" indicates that 125 °C Capacitance change of  $\pm 15\%$ .
- 2) "#" Indicates that the capacity change rate of 125 °C  $\pm 20\%$ , provided only the capacity deviation of the M-Class.



## 8.Taping And Packing

### 1) Carrier tape dimension

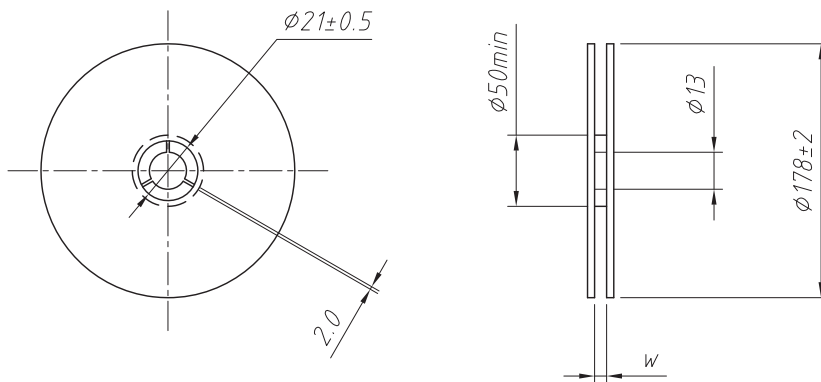


**CARRIER TAPE DIMENSION: Table(7)**

Unit (mm)

Case Code	W±0.3	F±0.1	E±0.1	P±0.1	P1±0.1	P2±0.1	D+0.1	D <sub>0</sub> min	t±0.3	A±0.2	B±0.2	K±0.2
P	8	3.5	1.75	4	2	4	φ1.5	φ1.0	0.2	1.4	2.2	1.2
A	8	3.5	1.75	4	2	4	φ1.5	φ1.0	0.2	1.9	3.5	1.9
B	8	3.5	1.75	4	2	4	φ1.5	φ1.0	0.3	3.3	3.8	2.1
C	12	5.5	1.75	8	2	4	φ1.5	φ1.5	0.3	3.7	6.4	3.0
D	12	5.5	1.75	8	2	4	φ1.5	φ1.5	0.3	4.8	7.7	3.3
E	12	5.5	1.75	8	2	4	φ1.5	φ1.5	0.3	4.8	7.7	4.1

### 2) Reel Specification Table(8)



Case Code	W	Qty/reel (178mm)
P	8.4+1.5	3000
A、B	8.4+1.5	2000
C、D	12.4+2	500
E	12.4+2	400

## Correct Use of Tantalum Chip Capacitors

### 1. Ripple Current and Ripple Voltage

If ripple current is applied, heat is generated within capacitor by Joule's heat (power dissipation) and it may affect to reliability of the capacitor.

#### (1) Power Dissipation

The actual power dissipated in capacitor is calculated using the formula1. :

$$P=I^2 \times ESR.....Formula 1$$

Where:

P: power Dissipation (Watts)

I: Ripple Current (Arms)

ESR: Equivalent Series Resistance ( $\Omega$ )

Table 1 Dissipation Ratings

Case Code	Maximum Power Dissipation Watts,100KHz,at 25°C
P	0.025
A	0.075
B	0.085
C	0.110
D	0.150
E	0.150

## (2) Ripple Current

Using P Max from Table 1, maximum ripple current (Arms) may be determined as follow:

$$I = \sqrt{P / ESR} \times K \times F \dots \dots \dots \text{Formula 2}$$

Where:

K: Temperature Derating Factor.... Table 2

F: Frequency Derating Factor...Table 3

ESR: Refer to Ratings

Table 2: Temperature Derating Factor

Temperature	Temperature Derating Factor K
25°C	1
85°C	0.9
125°C	0.4

Table 3: Frequency Derating Factor

Type	10KHz	100 KHz	500 KHz	1MHz
MnO2	0.80	1.00	1.15	1.20
Polymer	0.75	1.00	1.10	1.30

Ripple voltage E is calculated using the formula 3.

$$E = Z \times I \dots \dots \dots \text{Formula 3}$$

Where:

E: Ripple voltage

Z: Impedance at specified frequency

## (3) Ripple Voltage

The ripple voltage that may be applied is limited by three criteria:

- (a) The power dissipated in the ESR of the capacitor must not exceed the appropriate value specified in Table 1.
- (b) The sum of DC voltage and peak value of the ripple voltage must not exceed the rated voltage.
- (c) The negative peak value of the ripple voltage must not exceed the permissible reverse voltage value specified in the following section, Reverse Voltage.

## 2. Reverse Voltage

Because the solid tantalum capacitor is of polar type, do not apply a reverse voltage to it. If reverse voltage cannot be avoided, it must be applied for a short time and must not exceed the following values:

25°C .....10% max. of rated voltage or 1Vdc, whichever is smaller.

85°C .....5% max. of rated voltage or 0.5Vdc, whichever is smaller.

125°C .....1% max. of rated voltage or 0.1Vdc, whichever is smaller.

The capacitors should not be operated continuously in reverse mode, even within these limits.

### 3. Applied Voltage

- (1) For general application, apply 70% or less of the rated voltage to the capacitor.
- (2) When the capacitor is used in a power line or a low-impedance circuit, keep the applied voltage within 30% of the rated voltage to avoid the adverse influence of inrush current.
- (3) Derated voltage at 85°C or more.
- (4) When using a Chip-type capacitor at a temperature of 85°C or higher, calculate reduced voltage UT from the following expression. Note, however, that the ambient temperature must not exceed 125°C

$$UT=V0(UR-UC)(T-85)/40$$

Where:

UR: rated voltage (V)

UC: derated voltage at 125°C

T: ambient temperature (°C)

### 4. Current (Series Resistance)

Reliability of tantalum capacitor is increased by inserting a series resistance of at least 3Ω/V into circuits where current flow is momentary (Switching circuit, charge/discharge circuits, etc) If the capacitor is in a low-impedance circuit, the voltage applied to the capacitor should be less than 1/2 to 1/3 of DC rated voltage.

### 5. In the Case of Short-Circuit

Manganese oxide tantalum capacitor (conventional tantalum capacitor) is heated and may generate fire and be burned depending upon its excess current, time and other factors.

When design the circuit, provide as much margin as possible to maintain capacitor reliability.

### 6. Product Soldering

SMT Tantalum Capacitor is suitable for Reflow soldering, not suitable for wave flow soldering and hand soldering. Reflow soldering temperature must be  $\leq 260^{\circ}\text{C}$  for  $5 <$  seconds. If hand soldering is necessary, soldering iron power should be  $\leq 25\text{W}$ , temperature  $< 300^{\circ}\text{C}$ , soldering time  $< 3$  seconds, it is prohibited to contact soldering iron top with product leads and main product, use melted tin solder to contact leaded soldering.