

Passive components Sales Office

• Head Office

206, Cheomdansaneop Road,
Youngtong-gu,
Suwon, Kyonggi Province 443-743,
Korea

Europe

Tel: +82-31-210-6803
E-mail: wesley.roh@samsung.com

America

Tel: +82-31-210-6794
E-mail: randy.kim@samsung.com

Asia

Tel: +82-31-210-5348
E-mail: koogi@samsung.com

Domestic

Tel: +82-31-210-3757
E-mail: southjoy@samsung.com

• Manufacturing Site

Suwon Plant

206 Cheomdansaneop Road,
Youngtong-gu,
Suwon, Kyonggi Province 443-743,
Korea
Tel: +82-31-210-6794
E-mail: randy.kim@samsung.com

Busan Plant

1623-2, Songjeong-dong,
Kangseo-gu, Busan 618-270, Korea
Tel: +82-51-970-7671
E-mail: kyc.kweon@samsung.com

Tianjin Plant

27, Heiniu, Cheng-Road, Tianjin,
China 300210
Tel: +86-22-2830-3333(3450)
E-mail: gk.ryu@samsung.com

Philippines Plant

Calamba Premiere International Park,
Batino, Calamba, Laguna, Manila
Tel: +63-2-809-2873
E-mail: ksj1445@samsung.com

• Asia sales office

Shanghai Office

Rm 1408 Shanghai international
trade center No 2200 Yan an(W) RD
Shanghai China 200335
Tel: 86-21-6270-4168(274)
E-mail: dennis.cha@samsung.com

Shenzhen Office

Rm 1903-1907, A 19F, Tianan Cyber
Times Tower, Tianan Cyber park,
Futian District Shenzhen Guang dong
province China
Tel: 86-755-8347-5500(605)
E-mail: jackson.xian@samsung.com

Qingdao Office

Rm 1201, Growne Plaza Qingdao;
76XiangGangZhong Rd, Qingdao;266071
P.R. China
Tel: 86-532-5779102
E-mail: zhengguo.cui@samsung.com

HongKong Office

8/F., Central Plaza, 18 Harbour Road,
Wanchai, HongKong, China
Tel: 852-2862-6000
E-mail: vinsent.chou@samsung.com

Singapore Office

3 Church Street Samsung Hub
#23-02 Singapore 049483
Tel: (65)6833-3228
E-mail: winson.yeong@samsung.com

Thai Office

Wellgrow Industrial Estate,
93 Moo 5 T. Bangsamak, A.Bangpakong
Chachoengsao 24180 Thailand
Tel: 66-38-562-026
E-mail: sbimm@samsung.com

Taiwan Office

399 9F-1, Ruey Kuang Rd., Neihu,
Taipei, Taiwan
Tel: 886-2-2656-8356
E-mail: kevin0130.wang@samsung.com

• America sales office

Irvine Office

92612 3345 Michelson Drive,
Suite 350, Irvine, CA
Tel: 1-949-797-8047
E-mail: sh386.kim@samsung.com

• Europe sales office

Frankfurt Office

D-65824 Samsung Haus am
Knonberger Hang 6 Schwalbach / Ts
Tel: 49-(0)6196-66-7255
E-mail: frank.goebel@samsung.com

Hungary Office

H2310, Szigetszentmiklos, Leshegy u.
2-4, Hungary
Tel: 36-24-551-148
E-mail: jun21c.lee@samsung.com

• Domestic Distributors

KORCHIP INC

#219-8 Gasan-dong, Gumchun-gu,
Seoul, Korea
Tel: +82-2-838-5588
E-mail: hjh0064@korchip.com

CHUNG HAN

#16-96 Hangang-lo 3, Youngsan-Gu,
Seoul, Korea
Tel: +82-2-718-3322
E-mail: bu1230choi@hanmail.net

SAMT

Daekyung Bldg., Daechi-Dong,
Gangnam-Gu, Seoul, Korea
Tel: +82-2-3458-9000
E-mail: info@isamt.com

CHUNGMAC

#53-5 Wonhyolo3 Youngsan-gu,
Seoul, Korea
Tel: +82-2-716-6428~9
E-mail: webmaster@anycam.co.kr

APEXINT

Room #905, C-dong Woorimlion's,
Valley 371-28, Gasan-dong,
Guemcheon-Gu, Seoul, Korea
Tel: +82-2-2026-2610(2)
E-mail: info@apexint.co.kr

SOLID TANTALUM CAPACITORS





We, Samsung, declare that our component tantalum capacitor is produced in accordance with EU RoHS directive.

1. RoHS Compliance

The following restricted materials are not used in packaging materials as well as products in compliance with the law and restriction.
 – Cd, Pb, Hg, Cr+6, PBB, PBDE

2. No use of materials breaking Ozone layer

The following ODS materials are not used in our fabrication process.
 – ODS material : Freon, Haron, 1-1-1 TCE, CCl₄, HCFC

If you want more detailed Information, Please Visit Samsung Electro-mechanics Website
[\[http://www.sem.samsung.com\]](http://www.sem.samsung.com)

Certification list of Samsung Factory

Certification	ISO 9001:2000 (Product)	QS 9000:2001 (Product)	TL 9000 (Product)	ISO 14001 (Factory)	ISO / TS16949:2002 (Product)
PHILIPPINES				BSI EMS77354	TS508248

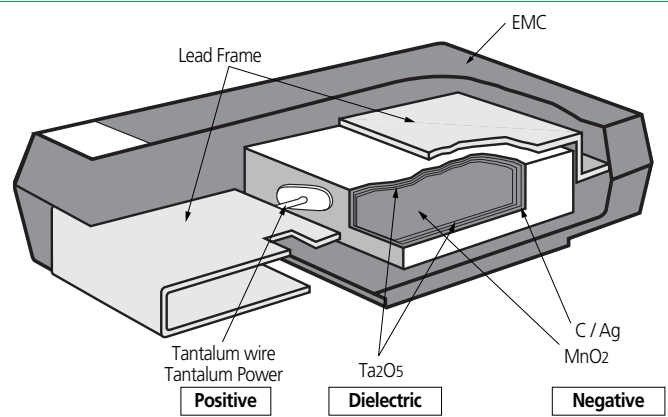
CONTENTS

Precautions in using Tantalum Capacitors	5
4 Characteristics Explanation	9
SCN Series –Standard series	13
SCS Series –Extended series	16
SCS P-CASE Series –2012 size miniaturized	20
SCM Series –1608 size Ultra miniaturized	22
SCF-U Series –1005 size Face-down type	24
SCE Series –Low-ESR	25
SCL Series –Low-profile	28
SVN Series –Standard series	30
SVS Series –Extended series	33
SVE Series –Low-ESR	39
Marking Specification	42
Taping Specification	45

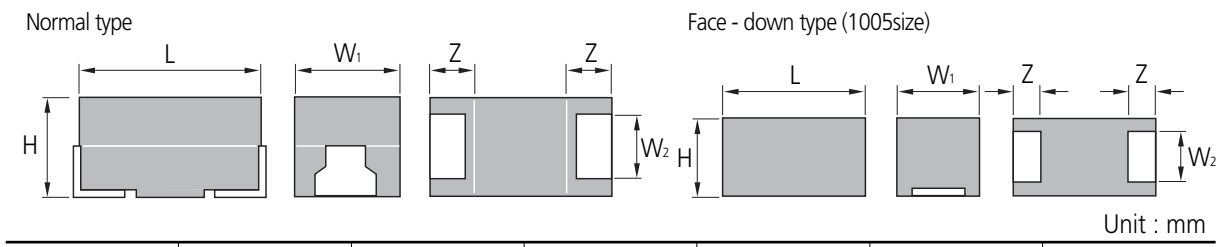
Precautions in using Tantalum Capacitors

Precautions in using Tantalum Capacitors

Feature



Configuration And Dimension



Case Code	EIA Code	L	W ₁	W ₂	H	Z
U*	1005	1.0±0.2	0.5±0.2	0.4±0.05	0.6 max	0.25±0.1
Q	1608L	1.6+0.15-0.1	0.85+0.15-0.1	0.6±0.1	0.75 max	0.4±0.1
J	1608-10	1.6+0.15-0.1	0.85+0.15-0.1	0.6±0.1	0.85+0.15-0.1	0.4±0.1
K	1608-9	1.6+0.15-0.1	0.85+0.15-0.1	0.6±0.1	0.90 max	0.4±0.1
R	2012L	2.0±0.2	1.25±0.2	0.9±0.1	0.95 max	0.5±0.2
P	2012	2.0±0.2	1.25±0.2	0.9±0.1	1.2 max	0.5±0.2
S	3216L	3.2±0.3	1.6±0.2	1.2±0.1	1.1±0.1	0.8±0.3
A	3216	3.2±0.2	1.6±0.2	1.2±0.1	1.6±0.2	0.8±0.3
T	3528L	3.5±0.2	2.8±0.2	2.2±0.1	1.2 max	0.8±0.3
B	3528	3.5±0.2	2.8±0.2	2.2±0.1	1.9±0.2	0.8±0.3
C	3062	6.0±0.3	3.2±0.3	2.2±0.1	2.5±0.3	1.3±0.3
D	7343	7.3±0.3	4.3±0.3	2.4±0.1	2.8±0.3	1.3±0.3

Case Code*(Face-down type)

Part Number Code

TC SCE 0J 107 M D A R 0150

Tantalum Capacitor _____

Type of series _____

Rated Voltage Code _____

Capacitance Code _____

Capacitance Tolerance Code _____

Case Size Code _____

Packing Code _____

(A=7 inches, C=13 inches)

Packing Polarity Code _____

Maximum ESR in Milliohms _____

Operational Attentions

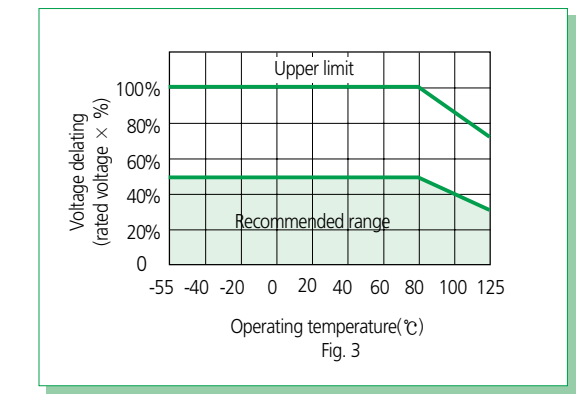
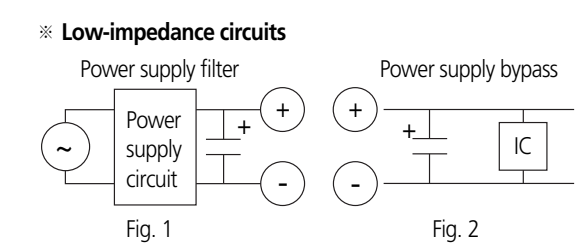
The operational attentions to the use of the tantalum capacitors are as follows:

- Electrical
- Environmental
- Conditions for mounting on equipment and circuit boards
- Mechanical vibration, shock

If the tantalum capacitors are used without satisfying any one of these conditions, the probability of short-circuiting, current leakage or other problems to occur increases. To avoid such problems, observe the following precautions when using the tantalum capacitors.

※ For using special purpose like Military, Medical, Aviation, Auto mobile device should be following a special specification.

- ### 1. Operating Voltage
- 1) The voltage derating factor should be as great as possible. Under normal conditions, the operating voltage should be reduced to 50% or less of the rating. It is recommended that the operating voltage be 30% or less of the rating, particularly when the tantalum capacitors are used in a low-impedance circuit(see Figs. 1, 2, and 3).
 - 2) For circuits in which a switching, charging, discharging, or other momentary current flows, it is recommended that the operating voltage be 30% or less of the rating, with a resistor connected in series to limit the current to 300 mA or less.
 - 3) When the tantalum capacitors are to be used at an ambient temperature of higher than 85 °C, the recommended operating range shown in Fig. 3 should not be exceeded.



2. Ripple

The maximum permissible ripple voltage and current are related to the ratings case size. Please consult us detail informations.

2.1 Ripple Current

The maximum permissible ripple current, IMAX, is calculated as follows:

$$I_{MAX} = \sqrt{\frac{P_{MAX}}{ESR(f)}}$$

where:

IMAX : Maximum permissible capacitor ripple current (Arms).

PMAX : Maximum permissible capacitor power loss (W).

Varies with the ambient temperature and case size.

Calculated according to Table 1.

ESR (f) : Capacitor equivalent series resistance (Ω).

Since the ESR(f) value varies with the ripple frequency, however, the following correction must be made in accordance with the operating frequency (see Fig. 4).

ESR(f) = K · ESR(120)

K: Coefficient for the operating frequency (Fig. 4).

ESR(120) = Tan δ · Xc = $\frac{\tan \delta}{2\pi f C}$

where:

ESR (120) : Equivalent series resistance at 120 Hz (Ω).

Xc : Capacitive reactance at 120 Hz (Ω).

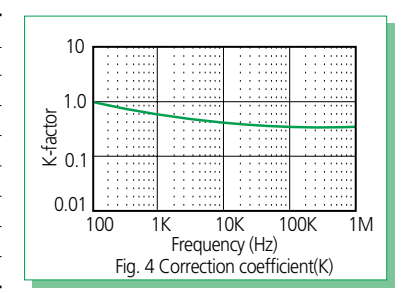
C : Electrostatic capacitance at 120 Hz (μF).

f : Operating frequency (Hz).

Table 1 Maximum permissible power loss values (PMAX) by case size

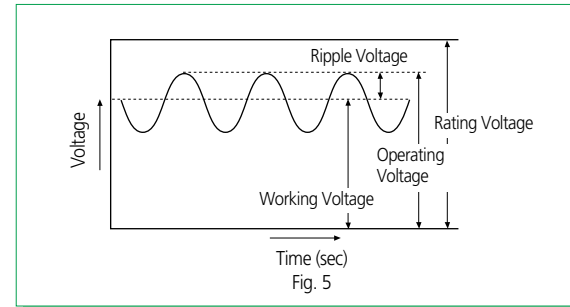
Ambient temperature(°C)	PMAX(W)						
	U	J,Q,K	P,R	A,S	B,T	C	D
25	0.015	0.015	0.015	0.030	0.030	0.030	0.050
55	0.010	0.010	0.010	0.019	0.019	0.019	0.032
85	0.005	0.005	0.005	0.010	0.010	0.010	0.018

Frequency	K
120	1.0
400	0.8
1k	0.65
10k	0.50
20k	0.45
40k	0.43
100k	0.40
1M	0.35



2.2 Ripple Voltage

If an excessive ripple voltage is applied to the tantalum capacitors, their internal temperature rises due to Joule heat, resulting in the detriment of their reliability.

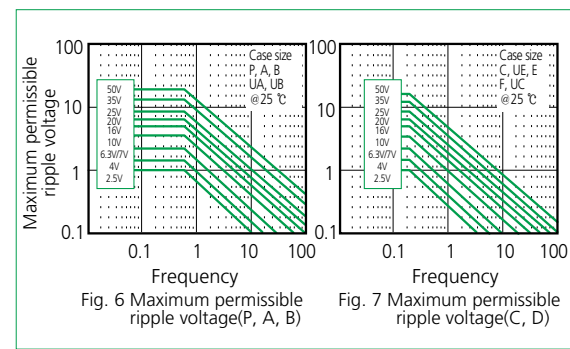


- 1) The tantalum capacitors must be used in such a conditions that the sum of the Working voltage and ripple voltage peak values does not exceed the rated voltage (Fig. 5)
- 2) Ensure that an reverse voltage due to superimposed voltages is not applied to the capacitors.
- 3) The maximum permissible ripple voltage varies with the rated voltage. Ensure that ripple voltage does not exceed the values shown in Figs. 6 and 7. If, however, the capacitors are used at a high temperature, the maximum permissible ripple voltage must be calculated as follows:

$$V_{rms}(\text{at } 55^{\circ}\text{C}) = 0.7 \times V_{rms}(\text{at } 25^{\circ}\text{C})$$

$$V_{rms}(\text{at } 85^{\circ}\text{C}) = 0.5 \times V_{rms}(\text{at } 25^{\circ}\text{C})$$

$$V_{rms}(\text{at } 125^{\circ}\text{C}) = 0.3 \times V_{rms}(\text{at } 25^{\circ}\text{C})$$



3. Reverse Voltage

Solid tantalum capacitors are polarized device and may be permanently damaged or destroyed, if connected with the wrong polarity.

- 1) The tantalum capacitors must not be operated and changed in reverse mode. And also the capacitors must not be used in an only AC circuit.
- 2) The tantalum capacitor dielectric has a rectifying characteristics. Therefore, when a reverse voltage is applied to it, a large current flows even at a low reverse voltage. As a result, it may spontaneously generate heat and lead to shorting.

- 3) Make sure that the polarity and voltage is correct when applying a multimeter or similar testing instrument to the capacitors because a reverse voltage or overvoltage can be accidentally applied.
- 4) When using the capacitors in a circuit in which a reverse voltage is applied, consult your local SAMSUNG ELECTRO-MECHANICS agent. If the application of an reverse voltage is unavoidable, it must not exceed the following values:
At 20°C: 10% of the rated voltage of 1 V, whichever smaller.
At 85°C: 5% of the rated voltage or 0.5 V, whichever smaller.

4. Reliability of Tantalum Capacitors

4.1 General

The failure rate of the tantalum capacitor varies with the derating ratio, ambient temperature, circuit resistance, circuit application, etc. Therefore, when proper selections are made so as to afford additional margins, higher reliabilities can be derived from the tantalum capacitors. Some examples of actual failure rates are presented below for your reference.

4.2 Failure Rate Calculation Formula

The tantalum capacitors are designed to work at their basic failure rates shown in Table 3 that prevail when the rated voltage is applied for 1000 hours at 85°C.

Table 3 Basic failure rate

Type	Classification	Basic failure rate
SCF	Face - down type	1%/1000h
SCE, SVE	Low ESR type	
SCM	Ultra-Miniature type (0603)	
SCL	Low profile type	
SCS, SVS	Small type	
SCN, SVN	Standard type	

Failure rate calculation formula

$$\lambda_{use} = \lambda_{85} \times K_V \times K_R$$

λ_{use} : Estimated capacitor failure rate under the operating conditions.

λ_{85} : Basic failure rate (Table 3)

K_V : Failure rate correction coefficient by the ambient temperature and derating factor.

K_R : Failure rate correction coefficient by the circuit resistance, which is the series-connected resistance divided by the voltage applied to the capacitor. This resistance is connected in series when the power supply side is viewed from the capacitor side.

$$K = (\text{derating factor}) = \text{operating voltage} / \text{rated voltage}$$

4.3 Reliability Prediction

Solid tantalum capacitors exhibit no degradation failure mode during shelf storage and show a constantly decreasing failure rate (i.e., absence of wearout mechanism) during life tests. This failure rate is dependent upon three important application conditions: DC voltage, temperature, and circuit impedance. Estimates of these respective effects are provided by the reliability nomograph. (Figure 9.)

The nomograph relates failure rate to voltage and temperature while the table relates failure rate to impedance.

These estimates apply to steady-state DC condition, and they assume usage within all other rated conditions.

Standard conditions, which produce a unity failure rate factor, are rated voltage, +85°C, and 0.1 ohm-per-volt impedance. While voltage and temperature are straight-forward, there is sometimes difficulty in determining impedance. What is required is the circuit impedance seen by the capacitor. If several capacitors are connected in parallel, the impedance seen by each is lowered by the source of energy stored in the other capacitors. Energy is similarly stored in series inductors. Voltage "de-rating" is a common and useful approach to improved reliability. It can be pursued too far, however, when it leads to installation of higher voltage capacitors of much larger size.

It is possible to lose more via higher inherent failure rate than is gained by voltage derating. SAMSUNG typically recommends 50% derating, especially in low impedance circuits.

Failure rate is conventionally expressed in units of percent per thousand hours. As a sample calculation, suppose a particular batch of capacitors has a failure rate of 0.5%/Khr under standard conditions.

What would be the predicted failure rate at 0.7 times rated voltage, 60°C and 0.6 Ω/V ?

The nomograph gives a factor of 7×10^{-2} and the table gives a factor of 0.4.

The failure rate estimate is then :

$$0.5 \times 7 \times 10^{-2} \times 0.4 = 1.4 \times 10^{-2} \text{ or } 0.014\% / \text{Khr}$$

Table 4 Circuit Impedance Reliability Factors

Circuit Impedance (ohms / volt)	Failure Rate Impedance (multiplying factor)
0.1	1.0
0.2	0.8
0.4	0.6
0.6	0.4
0.8	0.3
1.0	0.2
2.0	0.1
3 or greater	0.07

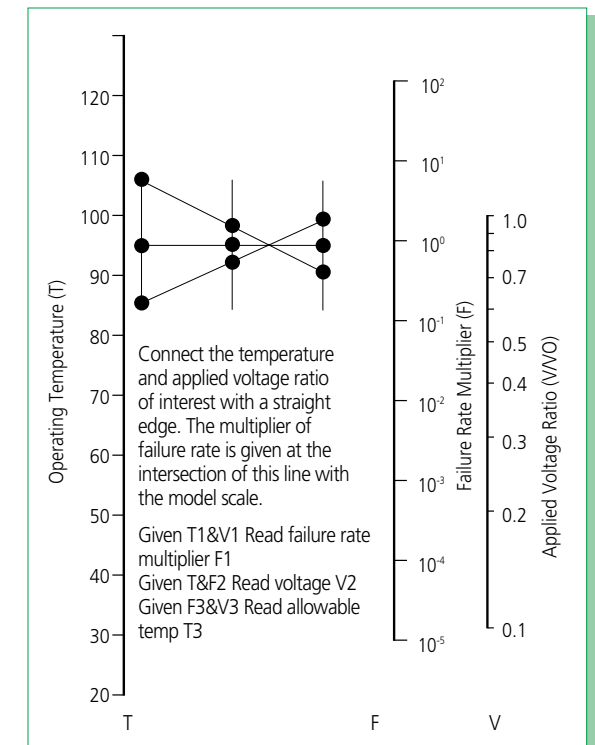


Fig. 9 Reliability Nomograph

5. Mounting Precautions

5.1 Limit Pressure on Capacitor Installation with Mounter

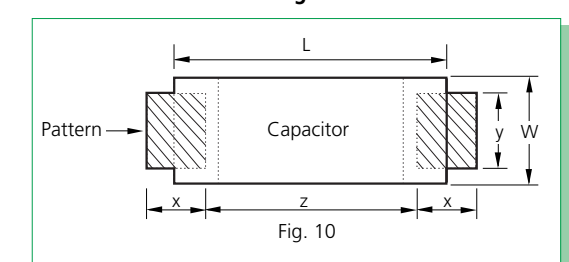
A capacitor that has been damaged should be discarded to avoid later problems resulting from mechanical stress. Pressure must not exceed 4.9 N with a tool end diameter of 1.5 mm when applied to the capacitors using an absorber, centering tweezers, or the like.

An excessively low absorber setting position would result in not only the application of undue force to the capacitors but capacitor and other component scattering, circuit board wiring breakage, and / or cracking as well, particularly when the capacitors are mounted together with other chips having a height of 1 mm or less.

5.2 Flux

- (1) Select a flux that contains a minimum of chlorine and amine.
- (2) After flux use, the chlorine and amine in the flux remain and must therefore be removed.

5.3 Recommended Soldering Pattern Dimensions



General type

Case	Dimensions	Capacitors size		Pattern dimensions		
		L	W	x	y	z
J,Q,K		1.6	0.85	0.9	1.0	0.7
P,R		2.0	1.25	1.2	1.1	0.8
A,S		3.2	1.6	1.6	1.2	1.2
B,T		3.5	2.8	1.6	2.2	1.4
C,V		5.8	3.2	2.3	2.4	2.4
D,W		7.3	4.3	2.3	2.6	3.8

Face - down type

Case	Dimensions	Capacitors size		Pattern dimensions		
		L	W	x	y	z
U		1.0	0.5	0.3	0.4	0.65

5.4 Chip Soldering Temperature and Time

Capacitors are capable of withstanding the following soldering temperatures and conditions;

- (1) Waved soldering
Capacitor body temperature: 230℃ ~ 260℃
Time: 5 seconds or less
- (2) Reflow soldering see figures

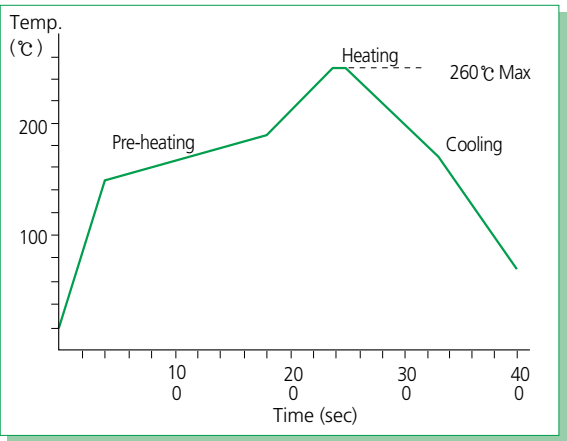


FIGURE: Typical Temperature Profile of Reflow Soldering for Pb-free Products (235℃~245℃, Recommendation Temperature)

- (3) Soldering with a soldering iron
The use of a soldering iron should be avoided wherever possible. If it is unavoidable, follow the instructions set forth in Table 5. The time of soldering with an iron should be one.

Table 5

Tape	All case
Soldering-iron tip temperature	350℃ MAX
Time	3sec MAX
Soldering-iron power	30W MAX

5.5 Cleaning after Mounting

The following solvents are usable when cleaning the capacitors after mounting. Never use a highly active solvent.

- Halogen organic solvent (HCFC225, etc.)
- Alcoholic solvent (IPA, ethanol, etc.)
- Petroleum solvent, alkali saponifying agent, water, etc.

Circuit board cleaning must be conducted at a temperature of not higher than 50° C and for an immersion time of not longer than 30 minutes. When an ultrasonic cleaning method is used, cleaning must be conducted at a frequency of 48 kHz or lower, at an vibrator output of 0.02 W/cm³, at a temperature of not higher than 40° C, and for a time of 5 minutes or shorter.

- NOTE 1: Care must be exercised in cleaning process so that the mounted capacitor will not come into contact with any cleaned object or the like or will not get rubbed by a stiff brush or the like. If such precautions are not taken particularly when the ultrasonic cleaning method is employed, terminal breakage may occur.
- NOTE 2: When performing ultrasonic cleaning under conditions other than stated above, conduct adequate advance checkout.

6. Other

- (1) For further details, refer to EIAJ RCR-2368, Precautions and Guidelines for Using Electronic Device Tantalum Capacitors.
- (2) If you have any questions, feel free to contact your local SAMSUNG ELECTRO-MECHANICS agent.

1. Capacitance

1-1. Rated Capacitance(Cr)

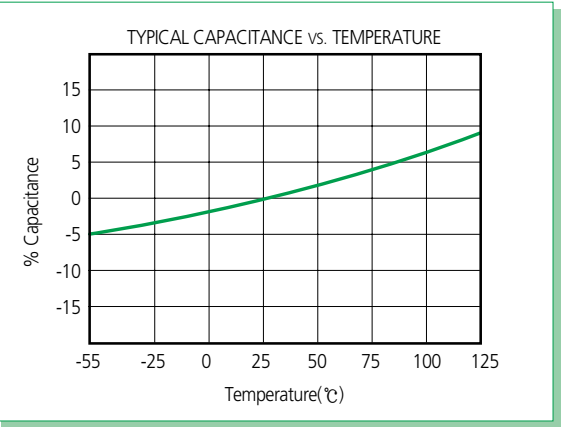
This is the nominal rated capacitance.
capacitance is measured at 120Hz, 1.0V RMS, DC Bias 1.0V~2.0V

1-2. Capacitance tolerance

This is the permissible variation of the actual value of the capacitance from the rated value.
Available in standard EIA nominal values with ±20% & ±10% tolerance.

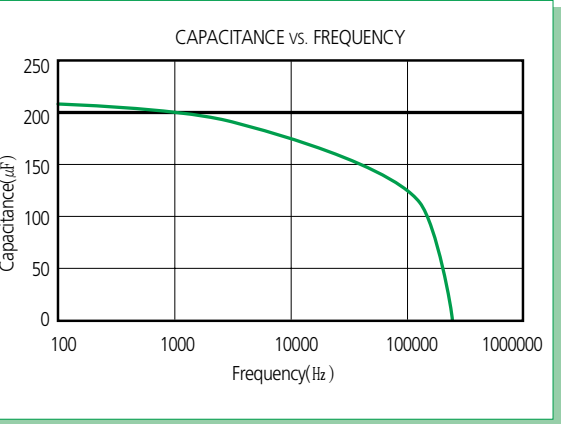
1-3. Temperature dependence of capacitance.

The capacitance of a tantalum capacitance varies with temperature.



1-4. Frequency dependence of capacitance

The effective capacitance decrease as frequency increases. Beyond 100kHz the capacitance continues to drop until resonance is reached.



2. Voltage

2-1. Rated voltage(Vr)

This is the rated d.c. voltage for continuous operation at 85℃.

2-2. Category voltage(Vc)

Tantalum capacitors are designed to operate continuously over the temperature range of -55℃ to +85℃ with operating voltage. these capacitance may be operated at 125℃ with 2/3 derated voltage as shown in fig.

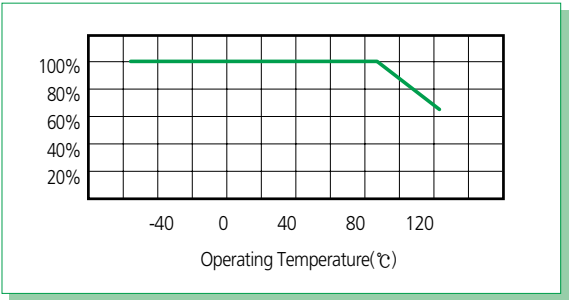


Figure 1 Working DC Voltage Change With Temperature

2-3. Surge voltage(Vs)

Surge voltage is the maximum voltage to which the capacitor can be subjected under transient conditions: including the sum of peak AC ripple, DC bias and any transients.
the surge voltage must not be used as a parameter in the design of circuits in which, in the normal course of operation, the capacitor is periodically charged and discharged.

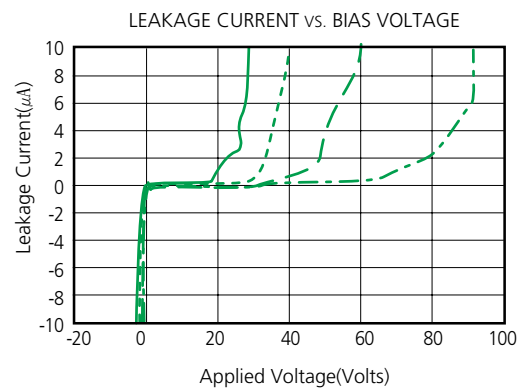
85℃		125℃	
Rated Voltage(Vdc)	Surge Voltage(Vdc)	Category Voltage(Vdc)	Surge Voltage(Vdc)
2.5	3.1	1.6	2.0
4	5.2	2.7	3.52
6.3	8	4	5
10	13	4	8
16	20	10	12
20	26	13	16
25	32	17	20
35	46	23	28
50	65	33	40

2-4. Reverse voltage and polarity.

Solid tantalum capacitors are polarized device and may be permanently damaged or destroyed if connected with the wrong polarity. They are intended to cover short term reversals of polarity, such as those occurring during switching transients or during a minor portion of an impressed waveform.

continuous application of reverse voltage without normal polarization will result in a degradation of leakage current. The peak reverse polarity voltage applied to the capacitor must not exceed:

- at +20°C, 10% of rated voltage
- at +85°C, 5% of rated voltage
- or 1V, whichever is greater.



If higher voltages of reverse polarity occur, then two capacitors with the same nominal capacitance and rated voltage should be connected in series in such a way as to form a non-polar combination (back-to-back configuration with the negative terminations connected together). When d.c. voltage is switched, measures must be taken to ensure that the reverse polarized capacitance avoid a reduction in its life expectancy.

2-5. Super imposed A.C. voltage ($V_{r.m.s}$) Ripple voltage.

This is the maximum r.m.s alternating voltage superimposed on a d.c. voltage, that may be applied to a capacitor.

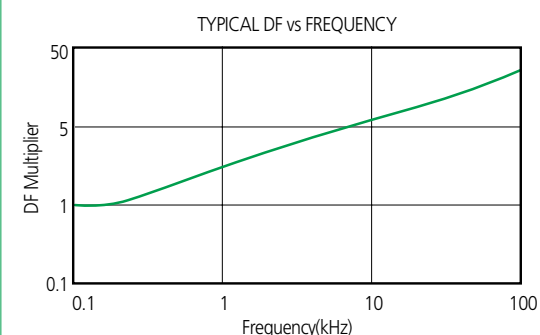
- 1) The sum of the working voltage and ripple voltage peak value does not exceed the rated d.c working voltage.
- 2) Ensure that an reverse voltage due to super imposed voltages is not applied to the capacitors.
- 3) If, however, the capacitors are used at a high temperature, the maximum permissible ripple voltage must be calculated as follows :

$$\begin{aligned} V_{rms} \text{ (at } 55^\circ\text{C)} &= 0.7 \times V_{rms} \text{ (at } 25^\circ\text{C)} \\ V_{rms} \text{ (at } 85^\circ\text{C)} &= 0.5 \times V_{rms} \text{ (at } 25^\circ\text{C)} \\ V_{rms} \text{ (at } 125^\circ\text{C)} &= 0.3 \times V_{rms} \text{ (at } 25^\circ\text{C)} \end{aligned}$$

3. Dissipation Factor (D.F.)

3.1. Dissipation factor (D.F.)

Refer to part number tables for maximum DF limits. Dissipation factor is measured at 120 Hz, 1.0V RMS and 1.0~2.0 volts DC at +25°C. The application of dc bias causes a small reduction in DF, about 0.2% when full rated voltage is applied DF increases with increasing frequency.



Dissipation factor is a very useful low frequency (120hz) measurement of the resistive component of a capacitor. It is the ratio of the equivalent series resistance (esr) to the capacitive reactance, (X_c) and is usually expressed as a percentage. It is directly proportional to both capacitance and frequency. Dissipation factor loses its importance at higher frequencies, (above about 1 kHz), when impedance, (Z) and equivalent series resistance (esr) are the normal parameters of concern.

$$DF = R/X_c = 2\pi fCR$$

where DF = dissipation factor

R = equivalent series resistance (ohms)

X_c = capacitive reactance (ohms)

f = frequency (hertz)

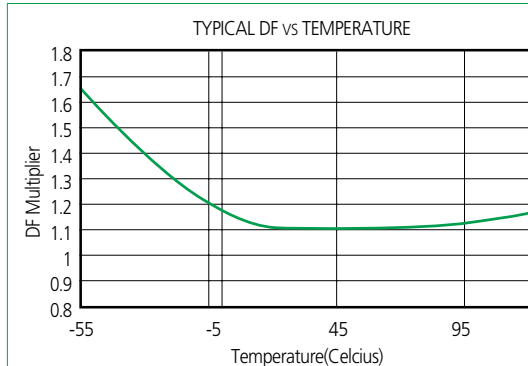
C = series capacitance (farads)

DF is also referred to as $\tan \delta$ or "loss tangent."

The "quality factor" "Q" is the reciprocal of DF.

DF increases with temperature above +25°C and may also increase at lower temperatures. Unfortunately, one general limit for DF cannot be specified for all capacitance/voltage combinations, nor can response to temperature be simply stated.

4. Impedance (Z) & ESR



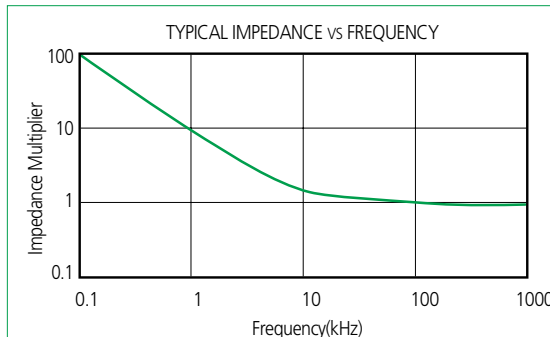
4. Impedance (Z), and Equivalent Series Resistance (ESR)

4-1 Impedance (Z)

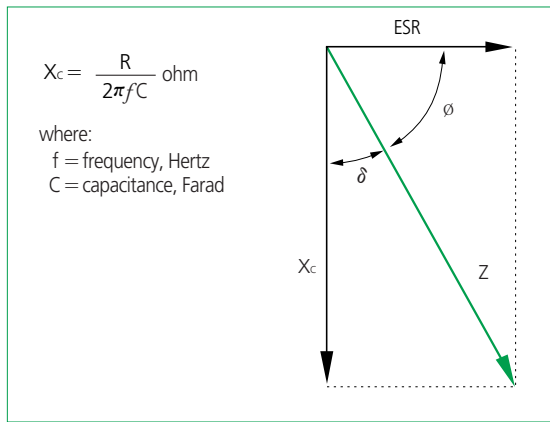
The impedance is measured at 25°C and 100KHz.

this is the ratio of voltage to current at a specified frequency.

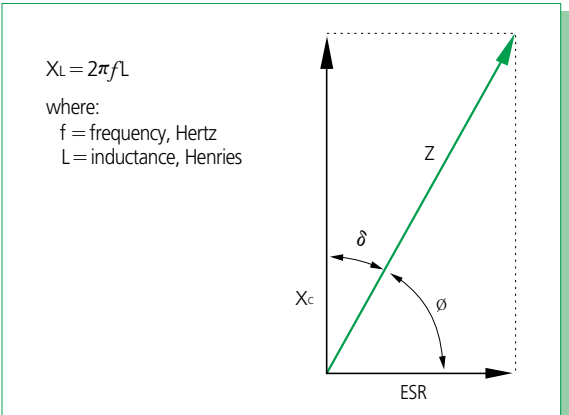
three factors contribute to the impedance of a tantalum capacitor; the resistance of the semiconductor layer; the capacitance value and the inductance of the electrode and leads. at high frequencies the inductance of leads becomes a limiting factor.



Total impedance of the capacitor is the vector sum of capacitive reactance (X_c) and ESR, below resonance; above resonance total impedance is the vector sum of inductive reactance (X_L) and ESR (Figure 5 and 6).



Total impedance of the Capacitor above Resonance



Total impedance of the Capacitor above Resonance

4-2. Equivalent Series Resistance (ESR)

The ESR is measured at 25°C and 100KHz.

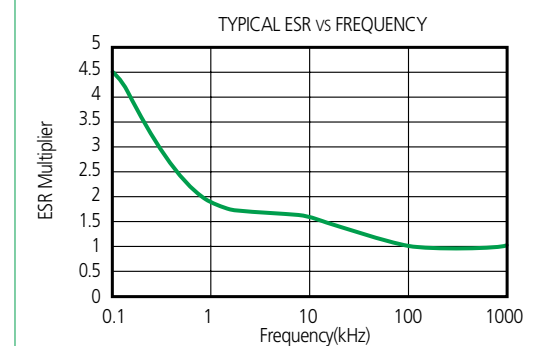
Resistance losses occur in all practical forms capacitors.

Equivalent Series Resistance (ESR) is the preferred high-frequency statement of the resistance unavoidably appearing in these capacitors. ESR is not a pure resistance, and it decreases with increasing frequency.

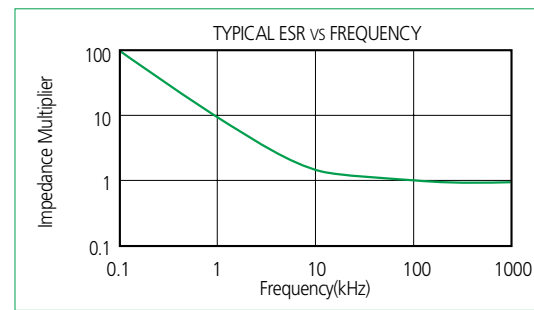
The ESR is frequency dependent and can be found by using the relationship;

$$ESR = \tan \delta / 2\pi fC$$

ESR is the contributing factors to impedance, and at high frequencies (100KHz and above) It becomes the dominant factor.

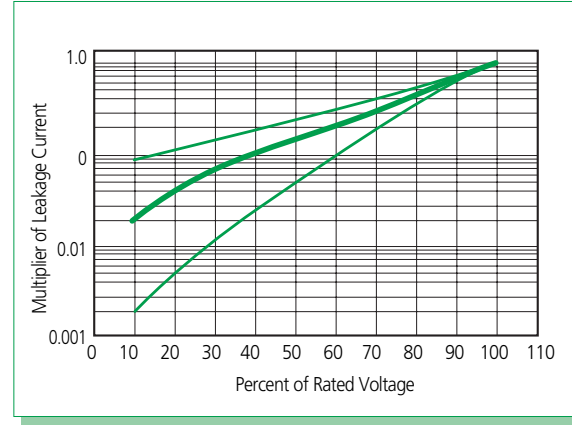
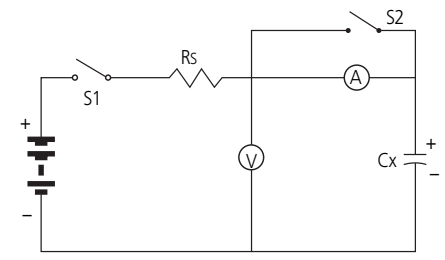


Typical impedance versus frequency curve is shown in Figure.



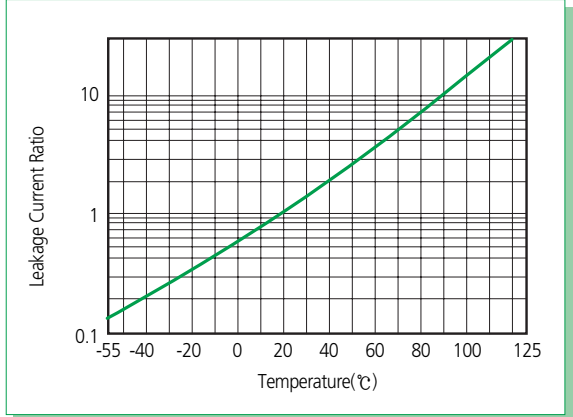
5. D. C. Leakage Current

The leakage current is dependent on the voltage applied, the elapsed time since the voltage was applied the component temp. it is measured at +25 °C with the rated voltage applied. the rated d.c voltage shall be applied to terminals across the test capacitor Cx. by the method as shown below.



Voltage vs DC Leakage Current

5-1 Temperature dependence of the leakage current



when operating at high temperature range from 85 °C to 125 °C, the operation shall be carried out at a derated voltage or less. Derating voltage Vt at any temperature between 85 °C and 125 °C shall be calculated by the following equation.

$$V_t = V_r - \frac{V_r - V_d}{40} (T - 85)$$

when Vt : Derated voltage at any temp.
Vr : Rated voltage
Vd : Derated voltage at 125 °C

5-2 Leakage Current vs Rated voltage
The leakage current drops rapidly below the value corresponding to the rated voltage VR When reduced voltage are applied. The effect of voltage derating on the leakage current is shown in the graph. This will also give a significant increase in the reliability for any application.



Feature

- The product is a standard type that has been most widely used among tantalum chip capacitors.
- Molded case available in four case codes.
 - Compatible with automatic pick and place equipment.
 - Meets or exceeds EIA standard 535BAAC.
 - Environment-Friendly(Pb-free) tantalum capacitor.

Specifications

Capacitance	Range	0.15μF to 68μF						
	Tolerance	±20%(M), ±10%(K)						
Dissipation Factor (Tan δ)	C ≤ 1.0μF	D.F ≤ 4.0%						
	1.5μF ≤ C ≤ 6.8μF	D.F ≤ 6.0%						
	10μF ≤ C ≤ 68μF	D.F ≤ 8.0%						
	C ≥ 100μF	D.F ≤ 10.0%						
Leakage Current		between 0.01CV and 0.5μA, whichever is larger						
Rated Voltage(VR)		4.0	6.3	10	16	20	25	35
Operating Voltage(V)	T ≤ 85 °C	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85 °C < T ≤ 125 °C	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T ≤ 85 °C	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85 °C < T ≤ 125 °C	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55 °C to 125 °C						

Standard value and case size

Cap.(μF)	W. V	4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)	35V(1V)
0.15	154							A
0.22	224							A
0.33	334						A	A
0.47	474					A	A	B
0.68	684				A	A		
1.0	105			A	A			B
1.5	155		A	A			B	
2.2	225	A	A			B		C
3.3	335	A			B	C	C	C
4.7	475			B	C	C	C	D
6.8	685		B	C	C	C	D	D
10	106	B	C	C	C	D	D	
15	156	C	C	C	D	D		
22	226	C	C	D	D			
33	336	C	D	D				
47	476	D	D					
68	686	D						

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA) @ +25°C Max.	DF (%) @ +25°C 120Hz Max.	ESR (Ω) @ +25°C 100KHz Max.
4 volt Rating @ +85°C (2.5 volt Rating @ +125°C)					
TCSCN0G225*AAR	A	2.2	0.5	6	10.0
TCSCN0G335*AAR	A	3.3	0.5	6	8.0
TCSCN0G106*BAR	B	10	0.5	6	3.5
TCSCN0G156*CAR	C	15	0.6	6	2.5
TCSCN0G226*CAR	C	22	0.9	6	1.8
TCSCN0G336*CAR	C	33	1.3	6	1.8
TCSCN0G476*DAR	D	47	1.9	6	1.0
TCSCN0G686*DAR	D	68	2.7	6	0.8
6.3 volt Rating @ +85°C (4 volt Rating @ +125°C)					
TCSCN0J155*AAR	A	1.5	0.5	6	10.0
TCSCN0J225*AAR	A	2.2	0.5	6	8.0
TCSCN0J685*BAR	B	6.8	0.5	6	3.5
TCSCN0J106*CAR	C	10	0.6	6	3.0
TCSCN0J156*CAR	C	15	0.9	6	1.8
TCSCN0J226*CAR	C	22	1.4	6	1.8
TCSCN0J336*DAR	D	33	2.0	6	1.5
TCSCN0J476*DAR	D	47	3.0	6	0.8
10 volt Rating @ +85°C (6.3 volt Rating @ +125°C)					
TCSCN1A105*AAR	A	1.0	0.5	4	12.0
TCSCN1A155*AAR	A	1.5	0.5	6	8.0
TCSCN1A475*BAR	B	4.7	0.5	6	3.5
TCSCN1A685*CAR	C	6.8	0.7	6	3.0
TCSCN1A106*CAR	C	10	1.0	6	1.8
TCSCN1A156*CAR	C	15	1.5	6	1.8
TCSCN1A226*DAR	D	22	2.2	6	1.2
TCSCN1A336*DAR	D	33	3.3	6	0.8
16 volt Rating @ +85°C (10 volt Rating @ +125°C)					
TCSCN1C684*AAR	A	0.68	0.5	4	12.0
TCSCN1C105*AAR	A	1.0	0.5	4	10.0
TCSCN1C335*BAR	B	3.3	0.5	6	3.5
TCSCN1C475*CAR	C	4.7	0.7	6	3.0
TCSCN1C685*CAR	C	6.8	1.0	6	1.9
TCSCN1C106*CAR	C	10	1.6	6	1.8
TCSCN1C156*DAR	D	15	2.4	6	1.2
TCSCN1C226*DAR	D	22	3.5	6	0.8
20 volt Rating @ +85°C (13 volt Rating @ +125°C)					
TCSCN1D474*AAR	A	0.47	0.5	4	15.0
TCSCN1D684*AAR	A	0.68	0.5	4	12.0
TCSCN1D225*BAR	B	2.2	0.5	6	3.5
TCSCN1D335*CAR	C	3.3	0.7	6	3.5
TCSCN1D475*CAR	C	4.7	1.0	6	2.4
TCSCN1D685*CAR	C	6.8	1.4	6	1.9
TCSCN1D106*DAR	D	10	2.0	6	1.3
TCSCN1D156*DAR	D	15	3.0	6	1.0

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA) @ +25°C Max.	DF (%) @ +25°C 120Hz Max.	ESR (Ω) @ +25°C 100KHz Max.
25 volt Rating @ +85°C (16 volt Rating @ +125°C)					
TCSCN1E334*AAR	A	0.33	0.5	4	15.0
TCSCN1E474*AAR	A	0.47	0.5	4	14.0
TCSCN1E155*BAR	B	1.5	0.5	6	5.0
TCSCN1E335*CAR	C	3.3	0.8	6	2.5
TCSCN1E475*CAR	C	4.7	1.2	6	2.4
TCSCN1E685*DAR	D	6.8	1.7	6	1.4
TCSCN1E106*DAR	D	10	2.5	6	1.0
35 volt Rating @ +85°C (22 volt Rating @ +125°C)					
TCSCN1V154*AAR	A	0.15	0.5	4	19.0
TCSCN1V224*AAR	A	0.22	0.5	4	18.0
TCSCN1V334*AAR	A	0.33	0.5	4	15.0
TCSCN1V474*BAR	B	0.47	0.5	4	8.0
TCSCN1V105*BAR	B	1.0	0.5	4	5.0
TCSCN1V225*CAR	C	2.2	0.7	6	3.5
TCSCN1V335*CAR	C	3.3	1.2	6	2.5
TCSCN1V475*DAR	D	4.7	1.6	6	1.5
TCSCN1V685*DAR	D	6.8	2.3	6	1.3

All technical data relates to an ambient temperature of +25°C.
 Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.0 volts.
 DCL is measured at rated voltage after 5 minutes.
 * Insert K for ±10% tolerance and M for ±20%.



Feature

- Miniaturized tantalum chip capacitors with extened capacitance.
(Reduced size 1/2 to 1/3 in comparison with SCN.)
- Molded case available in four case codes.
 - New low profile size.
 - Compatible with automatic pick and place equipment.
 - Meets or exceeds EIA standard 535BAAC.
 - Environment-Friendly(Pb-free) tantalum capacitor.

Specifications

Capacitance	Range	0.47 μ F to 680 μ F							
	Tolerance	$\pm$ 20%(M), $\pm$ 10%(K)							
Dissipation Factor (Tan δ)		Refer to Specification							
Leakage Current		between 0.01CV and 0.5 μ A, whichever is larger							
Rated Voltage(VR)		2.5	4.0	6.3	10	16	20	25	35
Operating Voltage(V)	T $\leq$ 85 $^{\circ}$ C	2.5	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85 $^{\circ}$ C < T $\leq$ 125 $^{\circ}$ C	1.6	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T $\leq$ 85 $^{\circ}$ C	3.1	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85 $^{\circ}$ C < T $\leq$ 125 $^{\circ}$ C	2.0	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55 $^{\circ}$ C to 125 $^{\circ}$ C							

Standard value and case size

Cap.(μ F)	W. V	2.5V(0E)	4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)	35V(1V)
0.15	154								
0.22	224								
0.33	334								
0.47	474								A
0.68	684							A	A
1.0	105						A	A	A
1.5	155					A	A	A	A, B
2.2	225				A	A	A	A, B	B
3.3	335			A	A	A	A, B	A, B	B
4.7	475		A	A	A	A, B	A, B	B	C
6.8	685		A	A	A, B	A, B	B	B, C	C
10	106		A	A, B	A, B	A, B	B, C	C	C, D
15	156		A, B	A, B	A, B	B, C	C	C, D	C, D
22	226		A, B	A, B	A, B, C	B, C	B, C, D	C, D	D
33	336		A, B	A, B, C	A, B, C	B, C, D	C, D	D	D
47	476		A, B, C	A, B, C	B, C, D	C, D	D		
68	686		B, C	B, C, D	C, D	C, D	D		
100	107		A, B, C, D	B, C, D	(B), C, D	D	D		
150	157		C, D	C, D	D	D			
220	227	B	B, C, D	C, D	D				
330	337		D	D					
470	477		D	D					
680	687								

() : Under Development

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μ F)	DC Leakage (μ A) @ +25 $^{\circ}$ C Max.	DF (%) @ +25 $^{\circ}$ C 120Hz Max.	ESR (Ω) @ +25 $^{\circ}$ C 100KHz Max.
2.5 volt Rating @ +85 $^{\circ}$ C (1.6 volt Rating @ +125 $^{\circ}$ C)					
TCSCS0E227*BAR	B	220	5.5	18	1.2
4 volt Rating @ +85 $^{\circ}$ C (2.5 volt Rating @ +125 $^{\circ}$ C)					
TCSCS0G475*AAR	A	4.7	0.5	8	8.0
TCSCS0G685*AAR	A	6.8	0.5	8	6.0
TCSCS0G106*AAR	A	10	0.5	8	6.0
TCSCS0G156*AAR	A	15	0.6	8	4.0
TCSCS0G156*BAR	B	15	0.6	8	3.5
TCSCS0G226*AAR	A	22	0.9	8	4.0
TCSCS0G226*BAR	B	22	0.9	8	3.5
TCSCS0G336*AAR	A	33	1.3	8	4.0
TCSCS0G336*BAR	B	33	1.3	8	3.5
TCSCS0G476*AAR	A	47	1.9	8	2.0
TCSCS0G476*BAR	B	47	1.9	8	3.5
TCSCS0G476*CAR	C	47	1.9	8	1.8
TCSCS0G686*AAR	B	68	2.7	8	1.8
TCSCS0G686*CAR	C	68	2.7	8	1.6
TCSCS0G107*AAR	A	100	4.0	30	2.0
TCSCS0G107*BAR	B	100	4.0	8	0.8
TCSCS0G107*CAR	C	100	4.0	8	1.6
TCSCS0G107*DAR	D	100	4.0	8	0.8
TCSCS0G157*CAR	C	150	6.0	8	1.2
TCSCS0G157*DAR	D	150	6.0	8	0.8
TCSCS0G227MBAR	B	220	8.8	18	0.5
TCSCS0G227*CAR	C	220	8.8	8	0.6
TCSCS0G227*DAR	D	220	8.8	8	0.9
TCSCS0G337*DAR	D	330	13.2	8	0.7
TCSCS0G477*DAR	D	470	18.8	10	0.6
6.3 volt Rating @ +85 $^{\circ}$ C (4 volt Rating @ +125 $^{\circ}$ C)					
TCSCS0J335*AAR	A	3.3	0.5	8	8.0
TCSCS0J475*AAR	A	4.7	0.5	8	6.0
TCSCS0J685*AAR	A	6.8	0.5	8	6.0
TCSCS0J106*AAR	A	10	0.6	8	4.0
TCSCS0J106*BAR	B	10	0.6	8	3.5
TCSCS0J156*AAR	A	15	0.9	8	4.0
TCSCS0J156*BAR	B	15	0.9	8	3.5
TCSCS0J226*AAR	A	22	1.4	8	2.0
TCSCS0J226*BAR	B	22	1.4	8	3.5
TCSCS0J336*AAR	A	33	2	6	2.0
TCSCS0J336*BAR	B	33	2	8	3.0
TCSCS0J336*CAR	C	33	2	8	1.8
TCSCS0J476*AAR	A	47	3	12	2.0
TCSCS0J476*BAR	B	47	3	8	1.3
TCSCS0J476*CAR	C	47	3	8	1.6
TCSCS0J686*BAR	B	68	4.3	8	3.5
TCSCS0J686*CAR	C	68	4.3	8	1.2
TCSCS0J686*DAR	D	68	4.3	8	0.8
TCSCS0J107MBAR	B	100	6.3	10	0.8
TCSCS0J107*CAR	C	100	6.3	8	0.8
TCSCS0J107*DAR	D	100	6.3	8	0.8
TCSCS0J157*CAR	C	150	9.5	8	1.3
TCSCS0J157*DAR	D	150	9.5	8	0.9
TCSCS0J227*CAR	C	220	13.9	8	0.6
TCSCS0J227*DAR	D	220	13.9	8	0.7
TCSCS0J337*DAR	D	330	20.8	8	0.5
TCSCS0J477*DAR	D	470	29.6	10	0.3

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA) @ +25 °C Max.	DF (%) @ +25 °C 120Hz Max.	ESR (Ω) @ +25 °C 100KHz Max.
10 volt Rating @ +85 °C (6.3 volt Rating @ +125 °C)					
TCSCS1A225*AAR	A	2.2	0.5	8	8.0
TCSCS1A335*AAR	A	3.3	0.5	8	6.0
TCSCS1A475*AAR	A	4.7	0.5	8	6.0
TCSCS1A685*AAR	A	6.8	0.7	8	6.0
TCSCS1A685*BAR	B	6.8	0.7	8	3.5
TCSCS1A106*AAR	A	10	1	8	2.0
TCSCS1A106*BAR	B	10	1	8	3.5
TCSCS1A156*AAR	A	15	1.5	8	4.0
TCSCS1A156*BAR	B	15	1.5	8	3.5
TCSCS1A226*AAR	A	22	2.2	8	2.0
TCSCS1A226*BAR	B	22	2.2	8	3.0
TCSCS1A226*CAR	C	22	2.2	8	1.8
TCSCS1A336*AAR	A	33	3.3	12	2.0
TCSCS1A336*BAR	B	33	3.3	8	1.8
TCSCS1A336*CAR	C	33	3.3	8	1.6
TCSCS1A476*BAR	B	47	4.7	8	1.6
TCSCS1A476*CAR	C	47	4.7	8	1.2
TCSCS1A476*DAR	D	47	4.7	8	0.8
TCSCS1A686*CAR	C	68	6.8	8	0.9
TCSCS1A686*DAR	D	68	6.8	8	0.8
TCSCS1A107*CAR	C	100	10	8	1.2
TCSCS1A107*DAR	D	100	10	8	0.7
TCSCS1A157*DAR	D	150	15	8	0.8
TCSCS1A227*DAR	D	220	22	8	0.4
16 volt Rating @ +85 °C (10 volt Rating @ +125 °C)					
TCSCS1C155*AAR	A	1.5	0.5	8	8.0
TCSCS1C225*AAR	A	2.2	0.5	8	6.0
TCSCS1C335*AAR	A	3.3	0.5	8	6.0
TCSCS1C475*AAR	A	4.7	0.7	8	4.0
TCSCS1C475*BAR	B	4.7	0.7	8	3.5
TCSCS1C685*AAR	A	6.8	1.0	8	3.5
TCSCS1C685*BAR	B	6.8	1.0	8	3.5
TCSCS1C106*AAR	A	10	1.6	8	3.0
TCSCS1C106*BAR	B	10	1.6	8	3.5
TCSCS1C156*BAR	B	15	2.4	8	3.0
TCSCS1C156*CAR	C	15	2.4	8	1.8
TCSCS1C226*BAR	B	22	3.5	8	2.3
TCSCS1C226*CAR	C	22	3.5	8	1.6
TCSCS1C336*BAR	B	33	5.3	8	1.4
TCSCS1C336*CAR	C	33	5.3	8	1.5
TCSCS1C336*DAR	D	33	5.3	8	0.8
TCSCS1C476*CAR	C	47	7.5	8	1.4
TCSCS1C476*DAR	D	47	7.5	8	0.8
TCSCS1C686*CAR	C	68	10.9	8	1.4
TCSCS1C686*DAR	D	68	10.9	8	0.8
TCSCS1C107*DAR	D	100	16	8	0.7
TCSCS1C157*DAR	D	150	24	8	0.4

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA) @ +25 °C Max.	DF (%) @ +25 °C 120Hz Max.	ESR (Ω) @ +25 °C 100KHz Max.
20 volt Rating @ +85 °C (13 volt Rating @ +125 °C)					
TCSCS1D105*AAR	A	1.0	0.5	6	10.0
TCSCS1D155*AAR	A	1.5	0.5	8	8.0
TCSCS1D225*AAR	A	2.2	0.5	8	7.0
TCSCS1D335*AAR	A	3.3	0.7	8	4.0
TCSCS1D335*BAR	B	3.3	0.7	8	3.5
TCSCS1D475*AAR	A	4.7	1.0	8	3.5
TCSCS1D475*BAR	B	4.7	1.0	8	3.5
TCSCS1D685*BAR	B	6.8	1.4	8	3.5
TCSCS1D106*BAR	B	10	2.0	8	3.0
TCSCS1D106*CAR	C	10	2.0	8	1.8
TCSCS1D156*CAR	C	15	3.0	8	1.7
TCSCS1D226*BAR	B	22	4.4	6	1.8
TCSCS1D226*CAR	C	22	4.4	8	1.6
TCSCS1D226*DAR	D	22	4.4	8	0.8
TCSCS1D336*CAR	C	33	6.6	8	1.2
TCSCS1D336*DAR	D	33	6.6	8	0.8
TCSCS1D476*DAR	D	47	9.4	8	0.7
TCSCS1D686*DAR	D	68	13.6	8	0.7
TCSCS1D107*DAR	D	100	20.0	8	0.9
25 volt Rating @ +85 °C (16 volt Rating @ +125 °C)					
TCSCS1E684*AAR	A	0.68	0.5	6	10.0
TCSCS1E105*AAR	A	1.0	0.5	6	8.0
TCSCS1E155*AAR	A	1.5	0.5	8	8.0
TCSCS1E225*AAR	A	2.2	0.6	8	6.0
TCSCS1E225*BAR	B	2.2	0.6	8	4.5
TCSCS1E335*AAR	A	3.3	0.8	6	3.7
TCSCS1E335*BAR	B	3.3	0.8	8	3.5
TCSCS1E475*BAR	B	4.7	1.2	8	3.0
TCSCS1E685*BAR	B	6.8	1.7	8	2.8
TCSCS1E685*CAR	C	6.8	1.7	8	1.9
TCSCS1E106*BAR	B	10	2.5	8	1.8
TCSCS1E106*CAR	C	10	2.5	8	1.5
TCSCS1E156*CAR	C	15	3.7	8	1.5
TCSCS1E156*DAR	D	15	3.7	8	1.0
TCSCS1E226*CAR	C	22	5.5	8	1.2
TCSCS1E226*DAR	D	22	5.5	8	0.8
TCSCS1E336*DAR	D	33	8.2	8	0.7
35 volt Rating @ +85 °C (22 volt Rating @ +125 °C)					
TCSCS1V474*AAR	A	0.47	0.5	6	12.0
TCSCS1V684*AAR	A	0.68	0.5	6	10.0
TCSCS1V105*AAR	A	1.0	0.5	6	7.5
TCSCS1V155*AAR	A	1.5	0.5	8	7.5
TCSCS1V155*BAR	B	1.5	0.5	8	5.0
TCSCS1V225*BAR	B	2.2	0.7	8	4.2
TCSCS1V335*BAR	B	3.3	1.2	8	3.5
TCSCS1V475*CAR	C	4.7	1.6	8	2.5
TCSCS1V685*CAR	C	6.8	2.3	8	2.0
TCSCS1V106*CAR	C	10	3.5	8	1.6
TCSCS1V106*DAR	D	10	3.5	8	1.0
TCSCS1V156*CAR	C	15	5.3	8	1.4
TCSCS1V156*DAR	D	15	5.2	8	0.8
TCSCS1V226*DAR	D	22	7.7	8	0.9
TCSCS1V336MDAR	D	33	11.5	6	0.9

All technical data relates to an ambient temperature of +25 °C.
 Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.0 volts.
 DCL is measured at rated voltage after 5 minutes.
 * Insert K for ± 10% tolerance and M for ± 20%.



Feature

- Reduced to about 1/3 the cubic volume of the SCN.
- New low profile case size.
 - (0805 size tantalum chip capacitors)
 - Compatible with automatic pick and place equipment.
 - Meets or exceeds EIA standard 535BAAC.

Specifications

Capacitance	Range	0.22 μ F to 22 μ F					
	Tolerance	$\pm$ 20%(M), $\pm$ 10%(K)					
Dissipation Factor (Tan δ)		Refer to Specification					
Leakage Current		between 0.01CV and 0.5 μ A, whichever is larger					
Rated Voltage(VR)		4.0	6.3	10	16	20	25
Operating Voltage(V)	T $\leq$ 85 $^{\circ}$ C	4.0	6.3	10.0	16.0	20.0	25.0
	85 $^{\circ}$ C < T $\leq$ 125 $^{\circ}$ C	2.5	4.0	6.3	10.0	13.0	16.0
Surge Voltage(V)	T $\leq$ 85 $^{\circ}$ C	5.2	8.0	13.0	20.0	25.0	32.0
	85 $^{\circ}$ C < T $\leq$ 125 $^{\circ}$ C	3.2	5.0	8.0	13.0	16.0	20.0
Operating Temperature		-55 $^{\circ}$ C to 125 $^{\circ}$ C					

Standard value and case size

Cap.(μ F) \ W. V		4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)
0.22	224	P	P	P	P	
0.33	334					
0.47	474	P	P	P	P	P
0.68	684	P	P	P	P	P
1.0	105	P	P	P	P	
1.5	155					
2.2	225	P	P	P	P	
3.3	335	P	P	P		
4.7	475	P	P	P		
6.8	685	P	P			
10	106	P	P	P		
15	156					
22	226	P	P			
33	336		P	(P)		
47	476		(P)	(P)		
100	107	(P)	(P)			

(): Under Development

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μ F)	DC Leakage (μ A) @ +25 $^{\circ}$ C Max.	DF (%) @ +25 $^{\circ}$ C 120Hz Max.	ESR (Ω) @ +25 $^{\circ}$ C 100KHz Max.
4 volt Rating @ +85 $^{\circ}$ C (2.5 volt Rating @ +125 $^{\circ}$ C)					
TCSCS0G224*PAR	P	0.22	0.5	4	25
TCSCS0G474*PAR	P	0.47	0.5	4	25
TCSCS0G684*PAR	P	0.68	0.5	4	20
TCSCS0G105*PAR	P	1	0.5	6	20
TCSCS0G225*PAR	P	2.2	0.5	6	15
TCSCS0G335*PAR	P	3.3	0.5	6	8
TCSCS0G475*PAR	P	4.7	0.5	8	9
TCSCS0G685*PAR	P	6.8	0.5	6	8
TCSCS0G106*PAR	P	10	0.5	8	6
TCSCS0G226*PAR	P	22	0.9	8	3
6.3 volt Rating @ +85 $^{\circ}$ C (4 volt Rating @ +125 $^{\circ}$ C)					
TCSCS0J224*PAR	P	0.22	0.5	4	25
TCSCS0J474*PAR	P	0.47	0.5	4	25
TCSCS0J684*PAR	P	0.68	0.5	4	20
TCSCS0J105*PAR	P	1	0.5	6	20
TCSCS0J225*PAR	P	2.2	0.5	6	15
TCSCS0J335*PAR	P	3.3	0.5	6	8
TCSCS0J475*PAR	P	4.7	0.5	8	9
TCSCS0J685*PAR	P	6.8	0.5	6	8
TCSCS0J106*PAR	P	10	0.6	8	5
TCSCS0J226*PAR	P	22	1.4	8	4
TCSCS0J336MPAR	P	33	2.1	18	2
10 volt Rating @ +85 $^{\circ}$ C (6.3 volt Rating @ +125 $^{\circ}$ C)					
TCSCS1A224*PAR	P	0.22	0.5	4	25
TCSCS1A474*PAR	P	0.47	0.5	4	25
TCSCS1A684*PAR	P	0.68	0.5	4	20
TCSCS1A105*PAR	P	1	0.5	6	20
TCSCS1A225*PAR	P	2.2	0.5	6	15
TCSCS1A335*PAR	P	3.3	0.5	6	8
TCSCS1A475*PAR	P	4.7	0.5	8	4
TCSCS1A106*PAR	P	10	1.0	8	6
16 volt Rating @ +85 $^{\circ}$ C (10 volt Rating @ +125 $^{\circ}$ C)					
TCSCS1C224*PAR	P	0.22	0.5	6	25
TCSCS1C474*PAR	P	0.47	0.5	6	25
TCSCS1C684*PAR	P	0.68	0.5	6	20
TCSCS1C105*PAR	P	1.0	0.5	6	20
TCSCS1C225*PAR	P	2.2	0.5	6	6.5
20 volt Rating @ +85 $^{\circ}$ C (13 volt Rating @ +125 $^{\circ}$ C)					
TCSCS1D474*PAR	P	0.47	0.5	4	25
TCSCS1D684*PAR	P	0.68	0.5	4	20

All technical data relates to an ambient temperature of +25 $^{\circ}$ C.
Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.0 volts.
DCL is measured at rated voltage after 5 minutes.
* Insert K for $\pm$ 10% tolerance and M for $\pm$ 20%.



Feature

- Reduced to about 40% the cubic volume of P Case.
- New low profile case size.
 - Compatible with automatic pick and place equipment.
 - Meets or Exceeds EIA standard 535BAAC.
 - Environment-Friendly(Pb-free) tantalum capacitor.

Specifications

Capacitance	Range	1.0 μ F to 10 μ F						
	Tolerance	$\pm$ 20%(M)						
Dissipation Factor (Tan δ)		Refer to Specification						
Leakage Current		between 0.01CV and 0.5 μ A, whichever is larger						
Rated Voltage(VR)		4.0	6.3	10	16	20	25	35
Operating Voltage(V)	T $\leq$ 85 $^{\circ}$ C	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85 $^{\circ}$ C $\leq$ T $\leq$ 125 $^{\circ}$ C	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T $\leq$ 85 $^{\circ}$ C	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85 $^{\circ}$ C $\leq$ T $\leq$ 125 $^{\circ}$ C	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55 $^{\circ}$ C to 125 $^{\circ}$ C						

Standard value and case size

W. V Cap.(μ F)		4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)
1.0	105	J	J	J	J		
1.5	155						
2.2	225	J	J	J	J		
3.3	335						
4.7	475	J	J, K	J			
6.8	685	J	J				
10	106	J, K, Q	J	J			
15	156						
22	226						

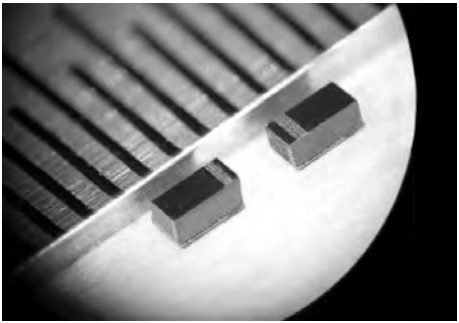
Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μ F)	DC Leakage (μ A) @ +25 $^{\circ}$ C Max.	DF (%) @ +25 $^{\circ}$ C 120Hz Max.	ESR (Ω) @ +25 $^{\circ}$ C Max.
4 volt Rating @ +85 $^{\circ}$ C (2.5 volt Rating @ +125 $^{\circ}$ C)					
TCSCM0G105MJAR	J	1.0	0.5	8.0	15
TCSCM0G225MJAR	J	2.2	0.5	8.0	10
TCSCM0G475MJAR	J	4.7	0.5	8.0	10
TCSCM0G685MJAR	J	6.8	0.5	8.0	6
TCSCM0G106MJAR	J	10	0.5	8.0	6
TCSCM0G106MKAR	K	10	0.5	20.0	6
TCSCM0G106MQAR	Q	10	0.5	18.0	9.4
6.3 volt Rating @ +85 $^{\circ}$ C (4 volt Rating @ +125 $^{\circ}$ C)					
TCSCM0J105MJAR	J	1.0	0.5	8.0	15
TCSCM0J225MJAR	J	2.2	0.5	8.0	10
TCSCM0J475MJAR	J	4.7	0.5	8.0	10
TCSCM0J475MKAR	K	4.7	0.5	20.0	8
TCSCM0J685MJAR	J	6.8	0.5	8.0	6
TCSCM0J106MJAR	J	10	0.63	8.0	4
10 volt Rating @ +85 $^{\circ}$ C (6.3 volt Rating @ +125 $^{\circ}$ C)					
TCSCM1A105MJAR	J	1.0	0.5	8.0	10
TCSCM1A225MJAR	J	2.2	0.5	8.0	10
TCSCM1A475MJAR	J	4.7	0.5	8.0	4
TCSCM1A106MJAR	J	10	1	20	7
16 volt Rating @ +85 $^{\circ}$ C (10 volt Rating @ +125 $^{\circ}$ C)					
TCSCM1C105MJAR	J	1.0	0.5	8.0	15
TCSCM1C225MJAR	J	2.2	0.5	8.0	7.5

All technical data relates to an ambient temperature of +25 $^{\circ}$ C.
Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.0 volts.
DCL is measured at rated voltage after 5 minutes.
Insert M tolerance for $\pm$ 20%.

SCF-1005 size CASE
(Face-down 1005 size Tantalum
Chip Capacitors)

SCE
(Low-ESR Tantalum
Chip Capacitors)



Feature

- SCF type is face down type with excellent performance characteristics for filtering, by-passing, coupling, blocking circuits
- Designed for very slim and high capacitance 1005 size
 - Molded Case available
 - Environmental Friendly Component(Halogen free)

Specifications

Capacitance	Range	1μF to 10μF						
	Tolerance	±20%(M)						
Dissipation Factor (Tan δ)		Refer to Specification						
Leakage Current		between 0.01CV and 0.5μA, whichever is larger						
Rated Voltage(Vr)		4.0	6.3	10	16	20	25	35
Operating Voltage(V)	T≤85℃	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85℃≤T≤125℃	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T≤85℃	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85℃≤T≤125℃	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55℃ to 125℃						

Standard value and case size

Cap.(μF) \ W. V		4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)
2.2	225		U			
3.3	335					
4.7	475	U	(U)			
6.8	685					
10	106	(U)				

() : Under Development

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA) @+25℃ Max.	DF(%) @+25℃ 120Hz Max.	ESR(Ω) @+25℃ Max.
4 Volt Rating @+85℃ (2.5 Volt Rating @+125℃)					
TCSCF0G475MUAR	U	4.7	0.5	10.0	15
6.3 Volt Rating @+85℃ (4Volt Rating @+125℃)					
TCSCF0J225MUAR	U	2.2	0.5	8.0	15



Feature

- Designed for very low ESR.
- Molded case available in four case codes.
 - Extended range values.
 - Compatible with automatic pick and place equipment.
 - Meets or exceeds EIA standard 535BAAC.
 - Suitable for high frequency as high speed PC, Switching Regulators, DC /DC converter, and etc.
 - Environment-Friendly(Pb-free) tantalum capacitor.

Specifications

Capacitance	Range	1.0μF to 470μF						
	Tolerance	±20%(M), ±10%(K)						
Dissipation Factor (Tan δ)		Refer to Specification						
Leakage Current		between 0.01CV and 0.5μA, whichever is larger						
Rated Voltage(VR)		4.0	6.3	10	16	20	25	35
Operating Voltage(V)	T≤85℃	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85℃<T≤125℃	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T≤85℃	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85℃<T≤125℃	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55℃ to 125℃						

Standard value and case size

Cap. \ VOLT		4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)	35V(1V)
1.0	105							A(3000)
1.5	155						A(3000) B(2000)	
2.2	225			A(3000)	A(3500)	A(3000)	B(3000)	B(2000)
3.3	335				A(3500)	A(2500)	B(2000)	
4.7	475			A(1800)	A(2000) B(2000)		B(1500)	C(1000)
6.8	685		A(1800)	A(1800)		B(1000)		
10	106		A(1500)	A(1800/2000) B(1000)	B(800/1000) C(600)	C(700)		
15	156		A(1500)	A(1500)	B(800)			D(600)
22	226		A(1200)	B(700)	C(500/400)		D(300)	D(400)
33	336		A(1000)	B(650) C(500)	C(400) D(400)			
47	476		B(500)	B(500/650) C(500) D(400)	C(350) D(200)			
68	686		B(500)	C(300) D(300)				
100	107		B(500) C(300)	C(250) D(150)				
220	227		C(250)	D(150)				
330	337							
470	477		D(200)					

NOTE: The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.

ESR limits quoted in brakets are in milliohms

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA) @ +25℃ Max.	DF (%) @ +25℃ 120Hz Max.	ESR (Ω) @ +25℃ Max.
6.3 volt Rating @ +85℃ (4 volt Rating @ +125℃)					
TCSCE0J685*AAR1800	A	6.8	0.5	8	1.8
TCSCE0J106*AAR1500	A	10	0.6	8	1.5
TCSCE0J156*AAR1500	A	15	1.0	8	1.5
TCSCE0J226*AAR1200	A	22	1.4	8	1.2
TCSCE0J336*AAR1000	A	33	2.1	8	1.0
TCSCE0J476*BAR0500	B	47	3.0	8	0.5
TCSCE0J686*BAR0500	B	68	4.3	8	0.5
TCSCE0J107*BAR0500	B	100	6.3	8	0.5
TCSCE0J107*CAR0300	C	100	6.3	8	0.3
TCSCE0J227*CAR0250	C	220	13.9	8	0.25
TCSCE0J477*DAR0200	D	470	29.6	10	0.2
10 volt Rating @ +85℃ (6.3 volt Rating @ +125℃)					
TCSCE1A225*AAR3000	A	2.2	0.5	8	3.0
TCSCE1A475*AAR1800	A	4.7	0.5	8	1.8
TCSCE1A685*AAR1800	A	6.8	0.7	8	1.8
TCSCE1A106*AAR2000	A	10	1.0	8	2.0
TCSCE1A106*AAR1800	A	10	1.0	8	1.8
TCSCE1A106*BAR1000	B	10	1.0	8	1.0
TCSCE1A156*AAR1500	A	15	1.5	8	1.5
TCSCE1A226*BAR0700	B	22	2.2	8	0.7
TCSCE1A336*BAR0650	B	33	3.3	8	0.65
TCSCE1A336*CAR0500	C	33	3.3	8	0.5
TCSCE1A476*BAR0650	B	47	4.7	8	0.65
TCSCE1A476*BAR0500	B	47	4.7	8	0.5
TCSCE1A476*CAR0500	C	47	4.7	8	0.5
TCSCE1A476*DAR0400	D	47	4.7	8	0.4
TCSCE1A686*CAR0300	C	68	6.8	8	0.3
TCSCE1A686*DAR0300	D	68	6.8	8	0.3
TCSCE1A107*CAR0250	C	100	10.0	8	0.25
TCSCE1A107*DAR0150	D	100	6.3	8	0.15
TCSCE1A227*DAR0150	D	220	22.0	8	0.15
16 volt Rating @ +85℃ (10 volt Rating @ +125℃)					
TCSCE1C225*AAR3500	A	2.2	0.5	8	3.5
TCSCE1C335*AAR3500	A	3.3	0.5	8	3.5
TCSCE1C475*AAR2000	A	4.7	0.8	8	2.0
TCSCE1C475*BAR2000	B	4.7	0.8	8	2.0
TCSCE1C106*BAR1000	B	10	1.6	8	1.0
TCSCE1C106*BAR0800	B	10	1.6	8	0.8
TCSCE1C106*CAR0600	C	10	1.6	8	0.6
TCSCE1C156*BAR0800	B	15	2.4	8	0.8
TCSCE1C226*CAR0500	C	22	3.5	8	0.5
TCSCE1C226*CAR0400	C	22	3.5	8	0.4
TCSCE1C336*CAR0400	C	33	5.3	8	0.4
TCSCE1C336*DAR0400	D	33	5.3	8	0.4
TCSCE1C476*CAR0350	C	47	7.5	8	0.35
TCSCE1C476*CAR0200	C	47	7.5	8	0.2

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA) @ +25℃ Max.	DF (%) @ +25℃ 120Hz Max.	ESR (Ω) @ +25℃ Max.
20 volt Rating @ +85℃ (13 volt Rating @ +125℃)					
TCSCE1D225*AAR3000	A	2.2	0.5	8	3.0
TCSCE1D335*AAR2500	A	3.3	0.5	8	2.5
TCSCE1D685*BAR1000	B	6.8	1.4	8	1.0
TCSCE1D106*CAR0700	C	10	2.0	8	0.7
25 volt Rating @ +85℃ (16 volt Rating @ +125℃)					
TCSCE1E155*AAR3000	A	1.5	0.5	8	3.0
TCSCE1E155*BAR2000	B	1.5	0.5	8	2.0
TCSCE1E225*BAR3000	B	2.2	0.6	8	3.0
TCSCE1E335*BAR2000	B	3.3	0.8	8	2.0
TCSCE1E475*BAR1500	B	4.7	1.2	8	1.5
TCSCE1E226*DAR0300	D	22	5.5	8	0.3
35 volt Rating @ +85℃ (22 volt Rating @ +125℃)					
TCSCE1V105*AAR3000	A	1.0	0.5	8	3.0
TCSCE1V225*BAR2000	B	2.2	0.7	8	2.0
TCSCE1V475*CAR1000	C	4.7	1.6	8	1.0
TCSCE1V156*DAR0600	D	15	5.3	8	0.6
TCSCE1V226*DAR0400	D	22	7.7	8	0.4

All technical data relates to an ambient temperature of +25℃ .
 Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.0 volts.
 DCL is measured at rated voltage after 5 minutes.
 * Insert K for ± 10% tolerance and M for ±20%.



Feature

- Low -profile case size
- Reduced thickness up to 64% of SCS series
- Molded Case available in four case codes.
- Compatible with automatic pick and place equipment.
- Meets or Exceeds EIA Standard 535BAAC.
- Terminations: 100 % Sn , RoHS Compliant

Specifications

Capacitance	Range	10 μ F to 100 μ F						
	Tolerance	$\pm$ 20%(M), $\pm$ 10%(K)						
Dissipation Factor (Tan δ)		Refer to Specification						
Leakage Current		between 0.01CV and 0.5 μ A, whichever is larger						
Rated Voltage(Vr)		4.0	6.3	10	16	20	25	35
Operating Voltage(V)	T $\leq$ 85 $^{\circ}$ C	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85 $^{\circ}$ C $\leq$ T $\leq$ 125 $^{\circ}$ C	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T $\leq$ 85 $^{\circ}$ C	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85 $^{\circ}$ C $\leq$ T $\leq$ 125 $^{\circ}$ C	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55 $^{\circ}$ C to 125 $^{\circ}$ C						

Standard value and case size

Cap.(μ F) \ W. V		4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)
10	106			R.S			
22	226	S	S				
33	336	S	S	S. (T)			
47	476			(T)			
68	686						
100	107	T					
150	157						

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μ F)	DC Leakage (μ A) @ +25 $^{\circ}$ C Max.	DF(%) @ +25 $^{\circ}$ C 120Hz Max.	ESR(Ω) @ +25 $^{\circ}$ C Max.
4 Volt Rating @+85 $^{\circ}$ C (2.5 Volt Rating @+125 $^{\circ}$ C)					
TCSCLOG226MSAR	S	22	0.88	10	2.0
TCSCLOG336MSAR	S	33	1.32	10	2.0
TCSCLOG107MTAR	T	100	4.00	20	1.3
6.3 Volt Rating @+85 $^{\circ}$ C (4Volt Rating @+125 $^{\circ}$ C)					
TCSCLOJ226MSAR	S	22	1.38	10	2.0
TCSCLOJ336MSAR	S	33	2.07	10	2.0
10 Volt Rating @+85 $^{\circ}$ C (6.3Volt Rating @+125 $^{\circ}$ C)					
TCSCLO1A106MRAR	R	10	1.0	8	3.0
TCSCLO1A106MSAR	S	10	1.0	8	4.0
TCSCLO1A336MSAR	S	33	3.3	10	1.1



Feature

- Environment-Freindly(Pb-free) tantalum capacitor with standard type
- Molded case available in four case codes.
 - Compatible with automatic pick and place equipment.

Specifications

Capacitance	Range	0.15μF to 68μF							
	Tolerance	±20%(M), ±10%(K)							
Dissipation Factor (Tan δ)	C ≤ 1.0μF	D.F ≤ 4.0%							
	1.5μF ≤ C ≤ 6.8μF	D.F ≤ 6.0%							
	10μF ≤ C ≤ 68μF	D.F ≤ 8.0%							
	C ≥ 100μF	D.F ≤ 10.0%							
Leakage Current		between 0.01CV and 0.5μA, whichever is larger							
Rated Voltage(VR)		2.5	4.0	6.3	10	16	20	25	35
Operating Voltage (V)	T ≤ 85℃	2.5	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85℃ ≤ T ≤ 125℃	1.6	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage (V)	T ≤ 85℃	3.1	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85℃ ≤ T ≤ 125℃	2.0	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55℃ to 125℃							

Standard value and case size

Cap.(μF)		W.V	4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)	35V(1V)
0.15	154								A
0.22	224								A
0.33	334							A	A
0.47	474						A	A	B
0.68	684					A	A		
1.0	105			A	A				B
1.5	155		A	A				B	
2.2	225	A	A				B		C
3.3	335	A			B	C	C	C	C
4.7	475			B	C	C	C	C	D
6.8	685		B	C	C	C	D	D	D
10	106	B	C	C	C	D	D		
15	156	C	C	C	D	D			
22	226	C	C	D	D				
33	336	C	D	D					
47	476	D	D						
68	686	D							

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @ +25℃ Max.	DF (%) @ +25℃ 120Hz Max.	ESR (Ω) @ +25℃ Max.
4 volt Rating @ +85℃ (2.5 volt Rating @ +125℃)					
TCSVN0G225*AAR	A	2.2	0.5	6	10.0
TCSVN0G335*AAR	A	3.3	0.5	6	8.0
TCSVN0G106*BAR	B	10	0.5	6	3.5
TCSVN0G156*CAR	C	15	0.6	6	2.5
TCSVN0G226*CAR	C	22	0.9	6	1.8
TCSVN0G336*CAR	C	33	1.3	6	1.8
TCSVN0G476*DAR	D	47	1.9	6	1.0
TCSVN0G686*DAR	D	68	2.7	6	0.8
6.3 volt Rating @ +85℃ (4 volt Rating @ +125℃)					
TCSVN0J155*AAR	A	1.5	0.5	6	10.0
TCSVN0J255*AAR	A	2.2	0.5	6	8.0
TCSVN0J685*BAR	B	6.8	0.5	6	3.5
TCSVN0J106*CAR	C	10	0.6	6	3.0
TCSVN0J156*CAR	C	15	0.9	6	1.8
TCSVN0J226*CAR	C	22	1.4	6	1.8
TCSVN0J336*DAR	D	33	2.0	6	1.5
TCSVN0J476*DAR	D	47	3.0	6	0.8
10 volt Rating @ +85℃ (6.3 volt Rating @ +125℃)					
TCSVN1A105*AAR	A	1.0	0.5	4	12.0
TCSVN1A155*AAR	A	1.5	0.5	6	8.0
TCSVN1A475*BAR	B	4.7	0.5	6	3.5
TCSVN1A685*CAR	C	6.8	0.7	6	3.0
TCSVN1A106*CAR	C	10	1.0	6	1.8
TCSVN1A156*CAR	C	15	1.5	6	1.8
TCSVN1A226*DAR	D	22	2.2	6	1.2
TCSVN1A336*DAR	D	33	3.3	6	0.8
16 volt Rating @ +85℃ (10 volt Rating @ +125℃)					
TCSVN1C684*AAR	A	0.68	0.5	4	12.0
TCSVN1C105*AAR	A	1.0	0.5	4	10.0
TCSVN1C335*BAR	B	3.3	0.5	6	3.5
TCSVN1C475*CAR	C	4.7	0.7	6	3.0
TCSVN1C685*CAR	C	6.8	1.0	6	1.9
TCSVN1C106*CAR	C	10	1.6	6	1.8
TCSVN1C156*DAR	D	15	2.4	6	1.2
TCSVN1C226*DAR	D	22	3.5	6	0.8
20 volt Rating @ +85℃ (13 volt Rating @ +125℃)					
TCSVN1D474*AAR	A	0.47	0.5	4	15.0
TCSVN1D684*AAR	A	0.68	0.5	4	12.0
TCSVN1D225*BAR	B	2.2	0.5	6	3.5
TCSVN1D335*CAR	C	3.3	0.7	6	3.5
TCSVN1D475*CAR	C	4.7	1.0	6	2.4
TCSVN1D685*CAR	C	6.8	1.4	6	1.9
TCSVN1D106*DAR	D	10	2.0	6	1.3
TCSVN1D156*DAR	D	15	3.0	6	1.0

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @+25℃ Max.	DF (%)@+25℃ 120Hz Max.	ESR (Ω)@+25℃ Max.
25 volt Rating @ +85℃ (16 volt Rating @ +125℃)					
TCSVN1E334*AAR	A	0.33	0.5	4	15.0
TCSVN1E474*AAR	A	0.47	0.5	4	14.0
TCSVN1E155*BAR	B	1.5	0.5	6	5.0
TCSVN1E335*CAR	C	3.3	0.8	6	2.5
TCSVN1E475*CAR	C	4.7	1.2	6	2.4
TCSVN1E685*DAR	D	6.8	1.7	6	1.4
TCSVN1E106*DAR	D	10	2.5	6	1.0
35 volt Rating @ +85℃ (22 volt Rating @ +125℃)					
TCSVN1V154*AAR	A	0.15	0.5	4	19.0
TCSVN1V224*AAR	A	0.22	0.5	4	18.0
TCSVN1V334*AAR	A	0.33	0.5	4	15.0
TCSVN1V474*BAR	B	0.47	0.5	4	8.0
TCSVN1V105*BAR	B	1.0	0.5	4	5.0
TCSVN1V225*CAR	C	2.2	0.7	6	3.5
TCSVN1V335*CAR	C	3.3	1.2	6	2.5
TCSVN1V475*DAR	D	4.7	1.6	6	1.5
TCSVN1V685*DAR	D	6.8	2.3	6	1.3

REMARKS
All technical data relates to an ambient temperature of +25℃.
Capacitance and DF are measured at 120Hz, 0.5V RMS with a maximum DC bias of 2.0 volts.
DCL is measured at rated voltage after 5 minutes.
* Insert K for ±10% tolerance and M for ±20%.



Feature

- Environment-Freindly(Pb-free) tantalum capacitor with reduced size(1/2 to 1/3 in comparison with SVN)
- Molded case available in five case codes.
 - Compatible with automatic pick and place equipment.

Specifications

Capacitance	Range	0.47μF to 680μF							
	Tolerance	±20%(M), ±10%(K)							
Dissipation Factor (Tan δ)		Refer to Specification							
Leakage Current		between 0.01CV and 0.5μA, whichever is larger							
Rated Voltage(VR)		2.5	4.0	6.3	10	16	20	25	35
Operating Voltage (V)	T ≤ 85℃	2.5	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85℃ ≤ T ≤ 125℃	1.6	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T ≤ 85℃	3.1	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85℃ ≤ T ≤ 125℃	2.0	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55℃ to 125℃							

Standard value and case size

Cap.(μF)		W.V	2.5V(0E)	4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)	35V(1V)
0.15	154									
0.22	224			P	P	P	P			
0.33	334									
0.47	474			P	P	P	P	P		A
0.68	684			P	P	P	P	P	A	A
1.0	105			P	P	P	P	A	A	A
1.5	155						A	A	A	A, B
2.2	225			P	P	P, A	P, A	A	A, B	B
3.3	335			P	P, A	P, A	A	A, B	B	B
4.7	475			P, A	P, A	P, A	A, B	A, B	B	C
6.8	685			P, A	P, A	A, B	A, B	B	B, C	C
10	106			P, A	P, A, B	P, A, B	A, B	B, C	C	C, D
15	156			A, B	A, B	A, B	B, C	C	C, D	C, D
22	226			P, A, B	P, A, B	A, B, C	B, C	B, C, D	C, D	D
33	336			A, B	A, B, C	A, B, C	B, C, D	C, D	D	D
47	476			A, B, C	A, B, C	B, C, D	C, D	D		
68	686			B, C	B, C, D	C, D	C, D	D		
100	107			A, B, C, D	B, C, D	(B), C, D	D	D		
150	157			C, D	C, D	D	D			
220	227	B		B, C, D	C, D	D				
330	337			D	D					
470	477			D	D					
680	687									

(): Under Development

Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @ +25℃ Max.	DF (%)@ +25℃ 120Hz Max.	ESR (Ω)@ +25℃ Max.
2.5 volt Rating @ +85℃ (4 volt Rating @ +125℃)					
TCSVS0E227*BAR	B	220	5.5	18	1.2
4 volt Rating @ +85℃ (2.5 volt Rating @ +125℃)					
TCSVS0G224*PAR	P	0.22	0.5	4	25.0
TCSVS0G474*PAR	P	0.47	0.5	4	25.0
TCSVS0G684*PAR	P	0.68	0.5	4	20.0
TCSVS0G105*PAR	P	1	0.5	6	20.0
TCSVS0G225*PAR	P	2.2	0.5	6	15.0
TCSVS0G335*PAR	P	3.3	0.5	6	8.0
TCSVS0G475*PAR	P	4.7	0.5	8	9.0
TCSVS0G475*AAR	A	4.7	0.5	8	8.0
TCSVS0G685*PAR	P	6.8	0.5	6	8.0
TCSVS0G685*AAR	A	6.8	0.5	8	6.0
TCSVS0G106*PAR	P	10	0.5	8	6.0
TCSVS0G106*AAR	A	10	0.5	8	6.0
TCSVS0G156*AAR	A	15	0.6	8	4.0
TCSVS0G156*BAR	B	15	0.6	8	3.5
TCSVS0G226*PAR	P	22	0.9	8	3.0
TCSVS0G226*AAR	A	22	0.9	8	4.0
TCSVS0G226*BAR	B	22	0.9	8	3.5
TCSVS0G336*AAR	A	33	1.3	8	4.0
TCSVS0G336*BAR	B	33	1.3	8	3.5
TCSVS0G476*AAR	A	47	1.9	8	2.0
TCSVS0G476*BAR	B	47	1.9	8	3.5
TCSVS0G476*CAR	C	47	1.9	8	1.8
TCSVS0G686*BAR	B	68	2.7	8	1.8
TCSVS0G686*CAR	C	68	2.7	8	1.6
TCSVS0G107*AAR	A	100	4.0	30	2.0
TCSVS0G107*BAR	B	100	4.0	8	0.8
TCSVS0G107*CAR	C	100	4.0	8	1.6
TCSVS0G107*DAR	D	100	4.0	8	0.8
TCSVS0G157*CAR	C	150	6.0	8	1.2
TCSVS0G157*DAR	D	150	6.0	8	0.8
TCSVS0G227MBAR	B	220	8.8	18	0.5
TCSVS0G227*CAR	C	220	8.8	8	0.6
TCSVS0G227*DAR	D	220	8.8	8	0.9
TCSVS0G337*DAR	D	330	13.2	8	0.7
TCSVS0G477*DAR	D	470	18.8	10	0.6

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @ +25℃ Max.	DF (%)@ +25℃ 120Hz Max.	ESR (Ω)@ +25℃ Max.
6.3 volt Rating @ +85℃ (4 volt Rating @ +125℃)					
TCSVS0J224*PAR	P	0.22	0.5	4	25.0
TCSVS0J474*PAR	P	0.47	0.5	4	25.0
TCSVS0J684*PAR	P	0.68	0.5	4	20.0
TCSVS0J105*PAR	P	1	0.5	6	20.0
TCSVS0J225*PAR	P	2.2	0.5	6	15.0
TCSVS0J335*PAR	P	3.3	0.5	6	8.0
TCSVS0J335*AAR	A	3.3	0.5	8	8.0
TCSVS0J475*PAR	P	4.7	0.5	8	9.0
TCSVS0J475*AAR	A	4.7	0.5	8	6.0
TCSVS0J685*PAR	P	6.8	0.5	6	8.0
TCSVS0J685*AAR	A	6.8	0.5	8	6.0
TCSVS0J106*PAR	P	10	0.6	8	5.0
TCSVS0J106*AAR	A	10	0.6	8	4.0
TCSVS0J106*BAR	B	10	0.6	8	3.5
TCSVS0J156*AAR	A	15	1.0	8	4.0
TCSVS0J156*BAR	B	15	1.0	8	3.5
TCSVS0J226MPAR	P	22	1.4	8	4.0
TCSVS0J226*AAR	A	22	1.4	8	2.0
TCSVS0J226*BAR	B	22	1.4	8	3.5
TCSVS0J336*AAR	A	33	2.1	6	2.0
TCSVS0J336*BAR	B	33	2.1	8	3.0
TCSVS0J336*CAR	C	33	2.1	8	1.8
TCSVS0J476*AAR	A	47	3.0	12	2.0
TCSVS0J476*BAR	B	47	3.0	8	1.3
TCSVS0J476*CAR	C	47	3.0	8	1.6
TCSVS0J686*BAR	B	68	4.3	8	3.5
TCSVS0J686*CAR	C	68	4.3	8	1.2
TCSVS0J686*DAR	D	68	4.3	8	0.8
TCSVS0J107MBAR	B	100	6.3	10	0.8
TCSVS0J107*CAR	C	100	6.3	8	0.8
TCSVS0J107*DAR	D	100	6.3	8	0.8
TCSVS0J157*CAR	C	150	9.5	8	1.3
TCSVS0J157*DAR	D	150	9.5	8	0.9
TCSVS0J227*CAR	C	220	13.9	8	0.6
TCSVS0J227*DAR	D	220	13.9	8	0.7
TCSVS0J337*DAR	D	330	20.8	8	0.5
TCSVS0J477*DAR	D	470	29.6	10	0.3

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @+25℃ Max.	DF (%)@+25℃ 120Hz Max.	ESR (Ω)@+25℃ Max.
10 volt Rating @+85℃ (6.3 volt Rating @+125℃)					
TCSVS1A224*PAR	P	0.22	0.5	4	25.0
TCSVS1A474*PAR	P	0.47	0.5	4	25.0
TCSVS1A684*PAR	P	0.68	0.5	4	20.0
TCSVS1A105*PAR	P	1	0.5	6	20.0
TCSVS1A225*PAR	P	2.2	0.5	6	15.0
TCSVS1A225*AAR	A	2.2	0.5	8	8.0
TCSVS1A335*PAR	P	3.3	0.5	6	8.0
TCSVS1A335*AAR	A	3.3	0.5	8	6.0
TCSVS1A475*PAR	P	4.7	0.5	8	4.0
TCSVS1A475*AAR	A	4.7	0.5	8	6.0
TCSVS1A685*AAR	A	6.8	0.7	8	6.0
TCSVS1A685*BAR	B	6.8	0.7	8	3.5
TCSVS1A106*PAR	P	10	1.0	8	6.0
TCSVS1A106*AAR	A	10	1.0	8	2.0
TCSVS1A106*BAR	B	10	1.0	8	3.5
TCSVS1A156*AAR	A	15	1.5	8	4.0
TCSVS1A156*BAR	B	15	1.5	8	3.5
TCSVS1A226*AAR	A	22	2.2	8	2.0
TCSVS1A226*BAR	B	22	2.2	8	3.0
TCSVS1A226*CAR	C	22	2.2	8	1.8
TCSVS1A336*AAR	A	33	3.3	12	2.0
TCSVS1A336*BAR	B	33	3.3	8	1.8
TCSVS1A336*CAR	C	33	3.3	8	1.6
TCSVS1A476*BAR	B	47	4.7	8	1.6
TCSVS1A476*CAR	C	47	4.7	8	1.2
TCSVS1A476*DAR	D	47	4.7	8	0.8
TCSVS1A686*CAR	C	68	6.8	8	0.9
TCSVS1A686*DAR	D	68	6.8	8	0.8
TCSVS1A107*CAR	C	100	10.0	8	1.2
TCSVS1A107*DAR	D	100	10.0	8	0.7
TCSVS1A157*DAR	D	150	15.0	8	0.8
TCSVS1A227*DAR	D	220	22.0	8	0.4

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @+25℃ Max.	DF (%)@+25℃ 120Hz Max.	ESR (Ω)@+25℃ Max.
16 volt Rating @+85℃ (10 volt Rating @+125℃)					
TCSVS1C224*PAR	P	0.22	0.5	6	25.0
TCSVS1C474*PAR	P	0.47	0.5	6	25.0
TCSVS1C684*PAR	P	0.68	0.5	6	20.0
TCSVS1C105*PAR	P	1	0.5	6	20.0
TCSVS1C155*AAR	A	1.5	0.5	8	8.0
TCSVS1C225*PAR	P	2.2	0.5	6	6.5
TCSVS1C225*AAR	A	2.2	0.5	8	6.0
TCSVS1C335*AAR	A	3.3	0.5	8	6.0
TCSVS1C475*AAR	A	4.7	0.8	6	4.0
TCSVS1C475*BAR	B	4.7	0.8	8	3.5
TCSVS1C685*AAR	A	6.8	1.1	8	3.5
TCSVS1C685*BAR	B	6.8	1.1	8	3.5
TCSVS1C106*AAR	A	10	1.6	8	3.0
TCSVS1C106*BAR	B	10	1.6	8	3.5
TCSVS1C156*BAR	B	15	2.4	8	3.0
TCSVS1C156*CAR	C	15	2.4	8	1.8
TCSVS1C226*BAR	B	22	3.5	8	2.3
TCSVS1C226*CAR	C	22	3.5	8	1.6
TCSVS1C336*BAR	B	33	5.3	8	1.4
TCSVS1C336*CAR	C	33	5.3	8	1.5
TCSVS1C336*DAR	D	33	5.3	8	0.8
TCSVS1C476*CAR	C	47	7.5	8	1.4
TCSVS1C476*DAR	D	47	7.5	8	0.8
TCSVS1C686*CAR	C	68	10.9	8	1.4
TCSVS1C686*DAR	D	68	10.9	8	0.8
TCSVS1C107*DAR	D	100	16.0	8	0.7
TCSVS1C157*DAR	D	150	24	8	0.4
20 volt Rating @+85℃ (13 volt Rating @+125℃)					
TCSVS1D474*PAR	P	0.47	0.5	4	25.0
TCSVS1D684*PAR	P	0.68	0.5	4	20.0
TCSVS1D105*AAR	A	1.0	0.5	6	10.0
TCSVS1D155*AAR	A	1.5	0.5	8	8.0
TCSVS1D225*AAR	A	2.2	0.5	8	7.0
TCSVS1D335*AAR	A	3.3	0.7	8	4.0
TCSVS1D335* BAR	B	3.3	0.7	8	3.5
TCSVS1D475*AAR	A	4.7	1.0	8	3.5
TCSVS1D475*BAR	B	4.7	1.0	8	3.5
TCSVS1D685*BAR	B	6.8	1.4	8	3.5
TCSVS1D106*BAR	B	10	2.0	8	3.0
TCSVS1D106*CAR	C	10	2.0	8	1.8
TCSVS1D156*CAR	C	15	3.0	8	1.7
TCSVS1D226*BAR	B	22	4.4	6	1.8
TCSVS1D226*CAR	C	22	4.4	8	1.6
TCSVS1D226*DAR	D	22	4.4	8	0.8
TCSVS1D336*CAR	C	33	6.6	8	1.2
TCSVS1D336*DAR	D	33	6.6	8	0.8
TCSVS1D476*DAR	D	47	9.4	8	0.7
TCSVS1D686*DAR	D	68	13.6	8	0.7
TCSVS1D107*DAR	D	100	20.0	8	0.9

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @ +25℃ Max.	DF (%) @ +25℃ 120Hz Max.	ESR (Ω) @ +25℃ Max.
25 volt Rating @ +85℃ (16 volt Rating @ +125℃)					
TCSVS1E684*AAR	A	0.68	0.5	6	10.0
TCSVS1E105*AAR	A	1.0	0.5	6	8.0
TCSVS1E155*AAR	A	1.5	0.5	8	8.0
TCSVS1E225*AAR	A	2.2	0.6	8	6.0
TCSVS1E225*BAR	B	2.2	0.6	8	4.5
TCSVS1E335*AAR	A	3.3	0.8	6	3.7
TCSVS1E335*BAR	B	3.3	0.8	8	3.5
TCSVS1E475*BAR	B	4.7	1.2	8	3.0
TCSVS1E685*BAR	B	6.8	1.7	8	2.8
TCSVS1E685*CAR	C	6.8	1.7	8	1.9
TCSVS1E106*BAR	B	10	2.5	8	1.8
TCSVS1E106*CAR	C	10	2.5	8	1.5
TCSVS1E156*CAR	C	15	3.8	8	1.5
TCSVS1E156*DAR	D	15	3.8	8	1.0
TCSVS1E226*CAR	C	22	5.5	8	1.2
TCSVS1E226*DAR	D	22	5.5	8	0.8
TCSVS1E336*DAR	D	33	8.3	8	0.7
35 volt Rating @ +85℃ (22 volt Rating @ +125℃)					
TCSVS1V474*AAR	A	0.47	0.5	6	12.0
TCSVS1V684*AAR	A	0.68	0.5	6	10.0
TCSVS1V105*AAR	A	1.0	0.5	6	7.5
TCSVS1V155*AAR	A	1.5	0.5	8	7.5
TCSVS1V155*BAR	B	1.5	0.5	8	5.0
TCSVS1V225*BAR	B	2.2	0.7	8	4.2
TCSVS1V335*BAR	B	3.3	1.2	8	3.5
TCSVS1V475*CAR	C	4.7	1.6	8	2.5
TCSVS1V685*CAR	C	6.8	2.4	8	2.0
TCSVS1V106*CAR	C	10	3.5	8	1.6
TCSVS1V106*DAR	D	10	3.5	8	1.0
TCSVS1V156*CAR	C	15	5.3	8	1.4
TCSVS1V156*DAR	D	15	5.3	8	0.8
TCSVS1V226*DAR	D	22	7.7	8	0.9
TCSVS1V336MDAR	D	33	11.55	6	0.9



Feature

Designed for very low ESR.

- Molded case available in five case codes.
- Extended range values.
- Compatible with automatic pick and place equipment.
- Meets or exceeds EIA standard 535BAAC.
- Suitable for high frequency as high speed PC, Switching Regulators, DC /DC converter, and etc.
- Environment-Friendly(Pb-free) tantalum capacitor.

Specifications

Capacitance	Range	1.0μF to 470μF						
	Tolerance	±20%(M), ±10%(K)						
Dissipation Factor (Tan δ)		Refer to Specification						
Leakage Current		between 0.01CV and 0.5μA, whichever is larger						
Rated Voltage(VR)		4.0	6.3	10	16	20	25	35
Operating Voltage(V)	T ≤ 85℃	4.0	6.3	10.0	16.0	20.0	25.0	35.0
	85℃ ≤ T ≤ 125℃	2.5	4.0	6.3	10.0	13.0	16.0	22.0
Surge Voltage(V)	T ≤ 85℃	5.2	8.0	13.0	20.0	25.0	32.0	44.0
	85℃ ≤ T ≤ 125℃	3.2	5.0	8.0	13.0	16.0	20.0	28.0
Operating Temperature		-55℃ to 125℃						

Standard value and case size

Cap.(μF)	W.V	4V(0G)	6.3V(0J)	10V(1A)	16V(1C)	20V(1D)	25V(1E)	35V(1V)
1.0	105							A(3000)
1.5	155						A(3000) B(2000)	
2.2	225			A(3000)	A(3500)	A(3000)	B(3000)	B(2000)
3.3	335				A(3500)	A(2500)	B(2000)	
4.7	475			A(1800)	A(2000) B(2000)		B(1500)	C(1000)
6.8	685		A(1800)	A(1800)		B(1000)		
10	106		A(1500)	A(1800/2000) B(1000)	B(800/1000) C(600)	C(700)		
15	156		A(1500)	A(1500)	B(800)			D(600)
22	226		A(1200)	B(700)	C(500/400)		D(300)	D(400)
33	336		A(1000)	B(650) C(500)	C(400) D(400)			
47	476		B(500)	B(500/650) C(500) D(400)	C(350) D(200)			
68	686		B(500)	C(300) D(300)				
100	107		B(500) C(300)	C(250) D(150)				
150	157							
220	227		C(250)	D(150)				
330	337							
470	477		D(200)					

NOTE: The EIA & CECC standards for low ESR Solid Tantalum Capacitors allow an ESR movement to 1.25 times catalogue limit post mounting.

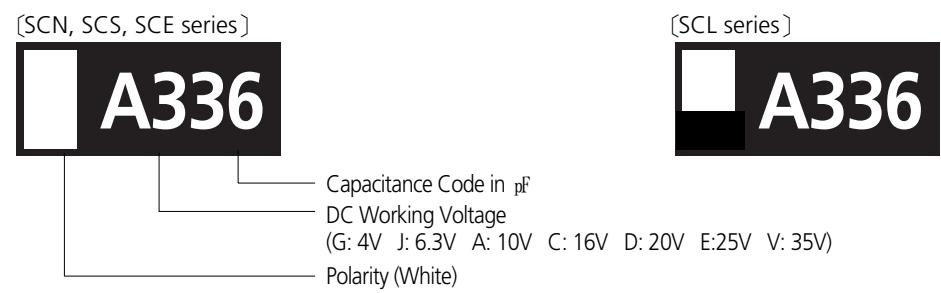
ESR limits quoted in brackets are in milliohms

Ratings & Part Number Reference

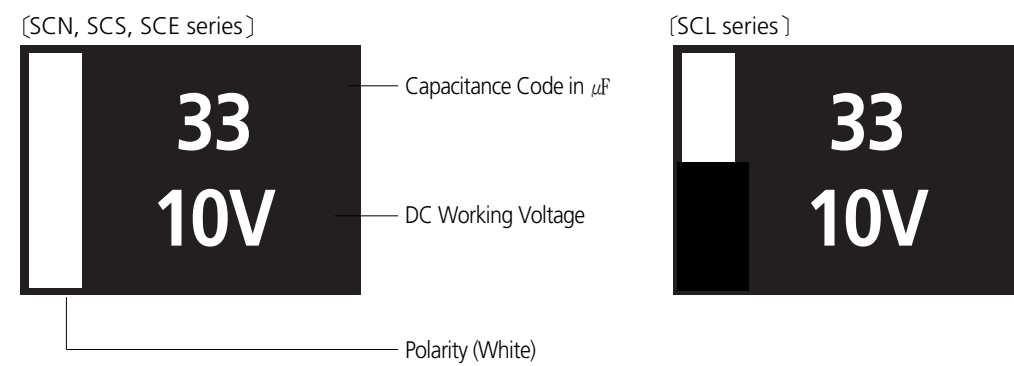
Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @ +25℃ Max.	DF (%)@ +25℃ 120Hz Max.	ESR (Ω)@ +25℃ Max.
6.3 volt Rating @ +85℃ (4 volt Rating @ +125℃)					
TCSVE0J685*AAR1800	A	6.8	0.5	8	1.80
TCSVE0J106*AAR1500	A	10	0.6	8	1.50
TCSVE0J156*AAR1500	A	15	1.0	8	1.50
TCSVE0J226*AAR1200	A	22	1.4	8	1.20
TCSVE0J336*AAR1000	A	33	2.1	8	1.00
TCSVE0J476*BAR0500	B	47	3.0	8	0.50
TCSVE0J686*BAR0500	B	68	4.3	8	0.50
TCSVE0J107*BAR0500	B	100	6.3	8	0.50
TCSVE0J107*CAR0300	C	100	6.3	8	0.30
TCSVE0J227*CAR0250	C	220	13.9	8	0.25
TCSVE0J477*DAR0200	D	470	29.6	10	0.20
10 volt Rating @ +85℃ (6.3 volt Rating @ +125℃)					
TCSVE1A225*AAR3000	A	2.2	0.5	8	3.00
TCSVE1A475*AAR1800	A	4.7	0.5	8	1.80
TCSVE1A685*AAR1800	A	6.8	0.7	8	1.80
TCSVE1A106*AAR2000	A	10	1.0	8	2.00
TCSVE1A106*AAR1800	A	10	1.0	8	1.80
TCSVE1A106*BAR1000	B	10	1.0	8	1.00
TCSVE1A156*AAR1500	A	15	1.5	8	1.50
TCSVE1A226*BAR0700	B	22	2.2	8	0.70
TCSVE1A336*BAR0650	B	33	3.3	8	0.65
TCSVE1A336*CAR0500	C	33	3.3	8	0.50
TCSVE1A476*BAR0650	B	47	4.7	8	0.65
TCSVE1A476*BAR0500	B	47	4.7	8	0.50
TCSVE1A476*CAR0500	C	47	4.7	8	0.50
TCSVE1A476*DAR0400	D	47	4.7	8	0.40
TCSVE1A686*CAR0300	C	68	6.8	8	0.30
TCSVE1A686*DAR0300	D	68	6.8	8	0.30
TCSVE1A107*CAR0250	C	100	10.0	8	0.25
TCSVE1A107*DAR0150	D	100	10.0	8	0.15
TCSVE1A227*DAR0150	D	220	22.0	8	0.15

Part Number	Case Size	Capacitance (μF)	DC Leakage(μA) @ +25℃ Max.	DF (%)@ +25℃ 120Hz Max.	ESR (Ω)@ +25℃ Max.
16 volt Rating @ +85℃ (10 volt Rating @ +125℃)					
TCSVE1C225*AAR3500	A	2.2	0.5	8	3.50
TCSVE1C335*AAR3500	A	3.3	0.5	8	3.50
TCSVE1C475*AAR2000	A	4.7	0.8	8	2.00
TCSVE1C475*BAR2000	B	4.7	0.8	8	2.00
TCSVE1C106*BAR1000	B	10	1.6	8	1.00
TCSVE1C106*BAR0800	B	10	1.6	8	0.80
TCSVE1C106*CAR0600	C	10	1.6	8	0.60
TCSVE1C156*BAR0800	B	15	2.4	8	0.80
TCSVE1C226*CAR0500	C	22	3.5	8	0.50
TCSVE1C226*CAR0400	C	22	3.5	8	0.40
TCSVE1C336*CAR0400	C	33	5.3	8	0.40
TCSVE1C336*DAR0400	D	33	5.3	8	0.40
TCSVE1C476*CAR0350	C	47	7.5	8	0.35
TCSVE1C476*CAR0200	C	47	7.5	8	0.20
20 volt Rating @ +85℃ (13 volt Rating @ +125℃)					
TCSVE1D225*AAR3000	A	2.2	0.5	8	3.00
TCSVE1D335*AAR2500	A	3.3	0.5	8	2.50
TCSVE1D685*BAR1000	B	6.8	1.4	8	1.00
TCSVE1D106*CAR0700	C	10	2.0	8	0.70
25 volt Rating @ +85℃ (16 volt Rating @ +125℃)					
TCSVE1E155*AAR3000	A	1.5	0.5	8	3.00
TCSVE1E155*BAR2000	B	1.5	0.5	8	2.00
TCSVE1E225*BAR3000	B	2.2	0.6	8	3.00
TCSVE1E335*BAR2000	B	3.3	0.8	8	2.00
TCSVE1E475*BAR1500	B	4.7	1.2	8	1.50
TCSVE1E226*DAR0300	D	22	5.5	8	0.30
35 volt Rating @ +85℃ (22 volt Rating @ +125℃)					
TCSVE1V105*AAR3000	A	1.0	0.5	8	3.00
TCSVE1V225*BAR2000	B	2.2	0.7	8	2.00
TCSVE1V475*CAR1000	C	4.7	1.6	8	1.00
TCSVE1V156*DAR0600	D	15	5.3	8	0.60
TCSVE1V226*DAR0400	D	22	7.7	8	0.40

A, S(low-profile) case

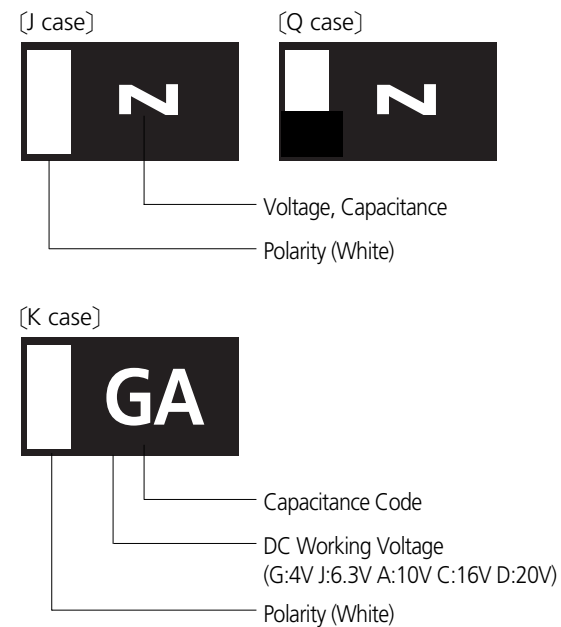


B, T (low-profile) case



J, Q, K Case

1608 case (SCM series)



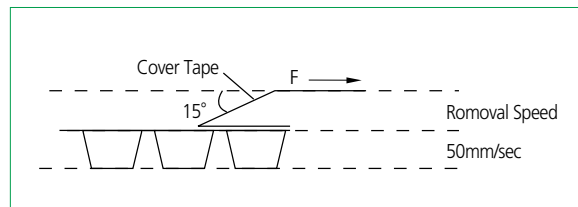
J, Q(low-profile) case Code Reference

μF \ V	4	6.3	10	16
1.0		a	B	C
1.5	D	E	F	G
2.2	I	J	K	L
3.3	M	N	O	P
4.7	R	S	T	U
6.8	V	W	X	Y
10	Z	A	b	

K case Code Reference

μF \ V	4	6.3	10	16
1.0				
1.5				
2.2				
3.3				
4.7		JS		
6.8				
10	GA			

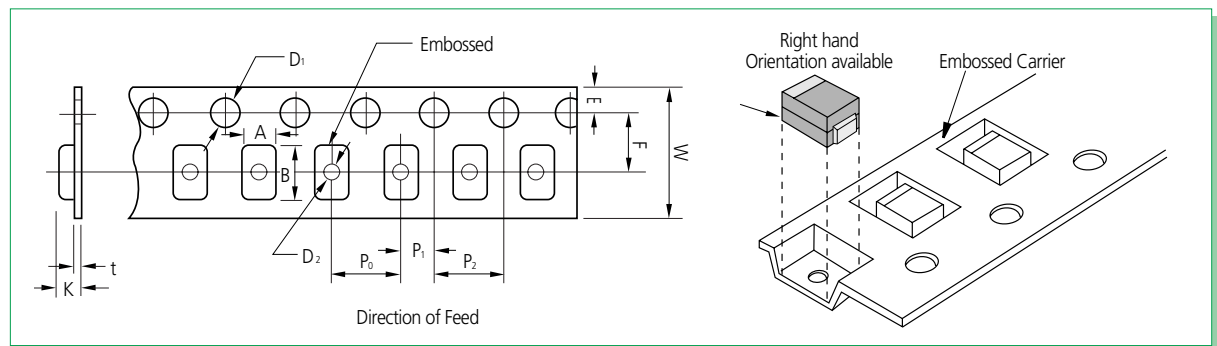
Taping Specification



The tantalum chip capacitors shall be packaged in tape and reel from for effective use.

Tape: Semitransparent embossed plastic
Cover tape: Attached with press, polyester
The tension of removing the cover tape, F=10~70g

Carrier Tape Dimension

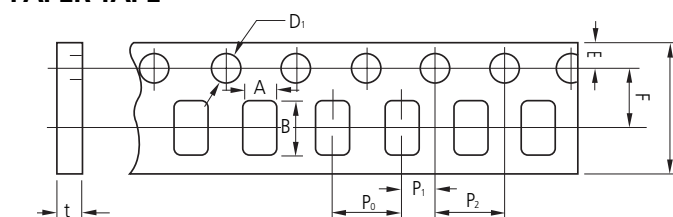


EMBOSSED PLASTIC TAPE

Unit: mm(inch)

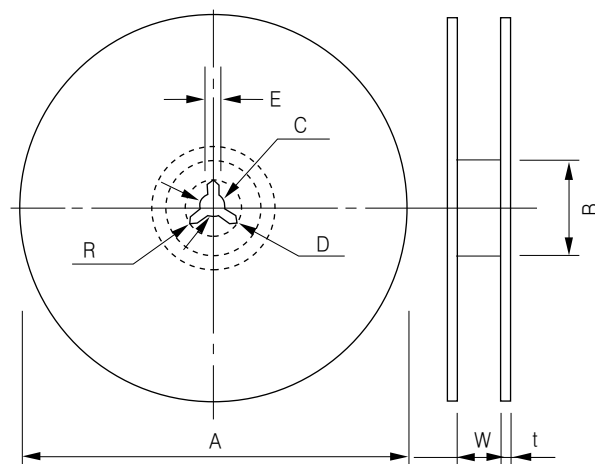
Case Code	W±0.3 (±0.002)	F±0.1 (±0.004)	E±0.1 (±0.004)	P0±0.1 (±0.004)	P1±0.1 (±0.004)	P2±0.1 (±0.004)	D1±0.1 (+0.004)	D2Min.	t	A±0.2 (±0.008)	B±0.2 (±0.008)	K±0.2 (±0.008)
Q								ø 0.6 (0.024)	0.25 (0.0098)	0.98 (0.039)	1.80 (0.071)	0.82 (0.032)
J,K												1.0 (0.039)
R												1.1 (0.043)
P	8 (0.315)	3.5 (0.138)		4 (0.157)					0.2 (0.008)	1.4 (0.055)	2.3 (0.091)	1.4 (0.055)
S			1.75 (0.069)		2 (0.079)	4 (0.157)	ø 1.5 (0.059)	ø 1.0 (0.039)		1.9 (0.075)	3.5 (0.138)	1.3 (0.051)
A												1.9 (0.075)
T												1.3 (0.051)
B									0.3 (0.012)	3.3 (0.130)	3.8 (0.150)	2.1 (0.083)
C	12 (0.472)	5.5 (0.217)		8 (0.315)				ø 1.5 (0.059)		3.7 (0.146)	6.4 (0.252)	3.0 (0.118)
D										4.8 (0.189)	7.7 (0.303)	3.3 (0.130)

PAPER TAPE



Case Code	W±0.1 (±0.004)	F±0.05 (±0.002)	E±0.05 (±0.002)	P0±0.1 (±0.004)	P1±0.1 (±0.004)	P2±0.05 (±0.002)	D1±0.03 (+0.001)	t±0.05 (±0.002)	A±0.03 (+0.001)	B±0.03 (+0.001)
U	8 (0.315)	3.5 (0.138)	1.75 (0.069)	4 (0.157)	2 (0.079)	4 (0.157)	ø 1.55 (0.061)	0.60 (0.024)	0.82 (0.032)	1.32 (0.052)

Reel Dimension



Unit: mm

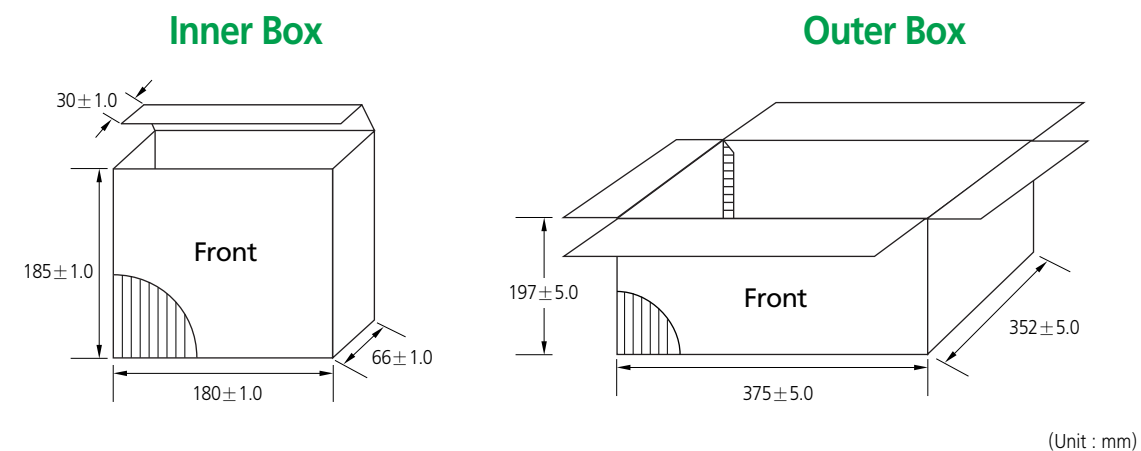
Symbol	Tape Width	A	B	C	D
7" Reel	8mm	$\varnothing 180 \pm 0.3$	$\varnothing 60 \pm 1.0$	$\varnothing 13 \pm 0.3$	$\varnothing 25 \pm 0.5$
	12mm	$\varnothing 180 \pm 0.3$	$\varnothing 60 \pm 1.0$	$\varnothing 13 \pm 0.3$	$\varnothing 25 \pm 0.5$
13" Reel	8mm	$\varnothing 330 \pm 2.0$	$\varnothing 80 \pm 1.0$	$\varnothing 13 \pm 0.3$	$\varnothing 25 \pm 0.5$
	12mm	$\varnothing 330 \pm 2.0$		$\varnothing 13 \pm 0.3$	$\varnothing 25 \pm 0.5$
Symbol	Tape Width	E	W	t	R
7" Reel	8mm	2.0 ± 0.5	9 ± 0.5	1.2 ± 0.2	1.0
	12mm	2.0 ± 0.5	13 ± 0.5	1.2 ± 0.2	1.0
13" Reel	8mm	2.0 ± 0.5	9 ± 0.5	2.2 ± 0.2	1.0
	12mm	2.0 ± 0.5	13 ± 0.5	2.2 ± 0.2	1.0

Quantity Per Reel

Unit : mm(inch)

Case Code	178mm(7")reel	330mm(13")reel
U	4,000 pcs / Reel	-
J (Q), K	4,000 pcs / Reel	-
P (R)	3,000 pcs / Reel	-
A (S), B (T)	2,000 pcs / Reel	8,000 pcs / Reel
C, D	500 pcs / Reel	2,500 pcs / Reel

Packaging Table



(Unit : mm)

TYPE	Inch	Taping Packaging					Box Packaging							
		Packaging Code	Reels	Tape	Quantity	Weight (g)	Inner Box				Outer Box			
							Reels	Quantity Max	Weight (g)	Volume × 10 ⁻³ m ³	Inner Box	Quantity Max	Weight (g)	Volume × 10 ⁻³ m ³
1005	0402	AR	7"	paper Tape	4,000	100	5	20,000	0.55	2.197	10	200,000	5.7	26
1608	0603	AR	7"	Embo - ssed Tape	4,000	100	5	20,000	0.55	2.197	10	200,000	5.7	26
2012	0805	AR	7"		3,000	100	5	15,000	0.55	2.197	10	150,000	5.7	26
3216	1206	AR	7"		2,000	100	5	10,000	0.55	2.197	10	100,000	5.7	26
		CR	13"		8,000	700	5	40,000	3.6	9.286	5	200,000	18.2	50.279
3528	1311	AR	7"		2,000	180	5	10,000	1	2.197	10	100,000	10.2	26
		CR	13"		8,000	800	5	40,000	4.1	9.286	5	200,000	20.8	50.279
6032	2312	AR	7"		500	130	4	2,000	0.57	2.197	10	20,000	5.9	26
		CR	13"		2,500	650	4	10,000	2.8	9.286	5	50,000	14.2	50.279
7343	2818	AR	7"		500	180	4	2,000	0.8	2.197	10	20,000	8.2	26
		CR	13"		2,500	1000	4	10,000	4.16	9.286	5	50,000	20.7	50.279



Memo

