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SAMSUNG ELECTRO-MECHANICS

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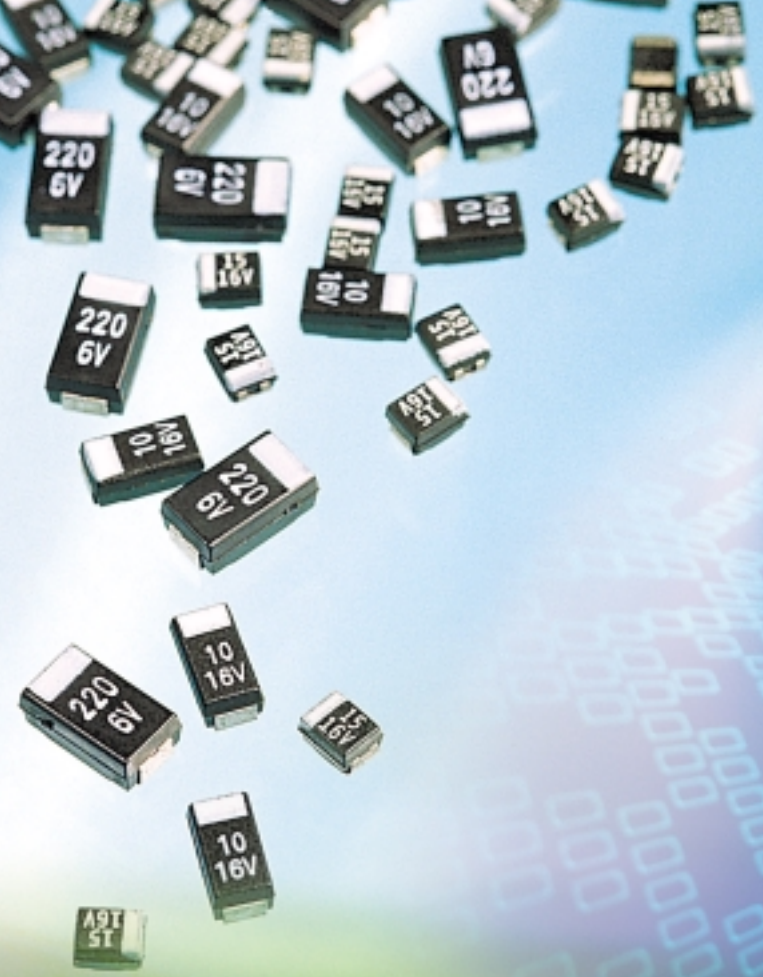
0104

SOLID TANTALUM CAPACITORS

SAMSUNG



ISO 9001

International Organization for Standardization

Registered by UL to ISO 9001 under UL's accreditation by Raad voor de Certificatie(RvC), the Dutch Council for Certification.
Registration NO:A1901(1994.6.17)

WE WILL PROVIDE A CUSTOMER WITH HIGH RELIABLE PRODUCTS AND SERVICES

UL

RvC

INTRODUCTION

Tantalum capacitors are designed with excellent performance characteristics for filtering, by-passing, coupling, blocking, and R.C tunning circuits. They are used extensively in industrial, commercial, entertainment and medical electronic equipment. They exhibit the proven characteristics of wide temperature range and long-term stability.

The advantages of tantalum electrolytic capacitors consist of their chemical stability, the low thickness and high dielectric constant of the tantalum oxide layer, and the capability of sintering anodes with a very large surface from tantalum powder.

The low reactivity of the tantalum oxide layer allows the employment of highly conductive electrolytes, and thus achieves a low series resistance. Capacitance and dissipation factor in relation to temperature and frequency thus prove to be very favourable. Additionally, there is also the wide temperature range of several types from -55℃ to +125℃.

A further advantage of the dielectric being inactive is a leakage current that is smaller than of aluminium electrolytic capacitors which does not rise considerably even at dead storage. Tantalum electrolytic capacitors thus show a very long life during operation and storage

The capacitance of the tantalum electrolytic capacitors is very high due to the high dielectric constant and the low thickness of the tantalum oxide layer. The use of sintered anodes with a large suface allows very small dimensions that cannot be reached or exceeded by any other capacitor.

The tantalum electrolytic capacitors at issue are polarized capacitors. In the case of polarized electrolytic capacitors, the dielectric is structured in such a manner that the flow of current is interrupted in one direction.

It is therefore necessary to observe the indications regarding polarity when using these capacitors(positive pole on anode and negative pole on cathode). In the case of tantalum capacitors, a mispolarizing is permissible up to the values indicated in reversal voltage.

The tantalum capacitor is a polar electrolytic capacitor. The anode is a porous body of sintered tantalum powder. A layer of tantalum oxide is formed over the whole sintered anode surface by an electrolytic oxidation process. This oxide layer, which has a high dielectric constant($\varepsilon \approx 27$), functions as the dielectric medium of the capacitor. The final thickness of the layer determines the rated working voltage of the capacitor. Manganese dioxide, a solid semiconducting electrolyte, is deposited in the pores and on the external suface of the formed anode to serve as the cathode. Electrical connection to the cathode is effected by applying a metallic coating to the outer MnO_2 layer. As a result of the high stability of the oxide layer the leakage current to the capacitor is very small, even after prolonged storage. The use of a solid semiconducting electrolyte guarantees high stability of the electrical properties over long periods of time and over a wide range of temperatures and frequencies.

INDEX

ELECTRICAL

1. General Application Class

Solid tantalum capacitors are usually applied in circuits where the AC component is small compared to the DC component. Typical uses known to SAMSUNG Electro-Mechanics include blocking, by-passing, decoupling, and filtering. They are also used in timing circuits. If two of these polar capacitors are connected "back-to-back" (i.e., negative-to-negative or positive-to-positive), the pair may be used in AC applications (as a non-polar device).

2. Capacitance Range

SCN series: 0.15~68㎌
SCS series: 0.47~220㎌
SCE series: 0.47~220㎌

Refer to part number tables for available capacitance ratings and tolerances by series.
Capacitance is measured at 120Hz, up to 1.0 volt rms maximum and up to 1.5 volts DC maximum, at 25℃.

3. Operating Temperature Range

Tantalum capacitors are designed to operate continuously over the temperature range of -55℃ to +85℃ with operating voltage. These capacitors may be operated at 125℃ with 2/3 derated voltage as shown in Figure 1.

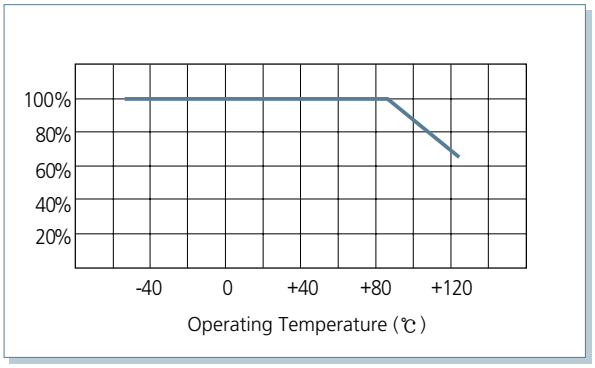


Figure 1 Working DC Voltage Change With Temperature

4. Working DC Voltage (WVDC)

Working Voltage Range : 4~35volts.
Refer to part number tables for available voltage ratings by series.These voltages are the maximum recommended peak DC operating voltages from -55℃ to +85℃ for continuous duty. These voltages are derated linearly above +85℃ to 2/3 rated voltage for operation at +125℃.

5. Surge Voltage

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.Surge voltage tests are performed at +25℃, +85℃ and +125℃ with the applicable surge voltage. The surge voltage is applied for 1000 cycles of 30 seconds at voltage through a 33 ohm series resistor and 30 seconds off voltage with the capacitor discharged through a 33 ohm resistor. Upon completing the test, the capacitors are allowed to stabilize at room temperature. Capacitance, DCL and DF are then tested:

a. Capacitance : within ±5% of initial value
b. DC Leakage: within initial limit
c. Dissipation Factor: within initial limit

6. Reverse Voltage and Polarity

Solid tantalum capacitors are polarized devices and may be permanently damaged or destroyed if connected with the wrong polarity.
The peak reverse polarity voltage applied to the capacitor must not exceed:
at +20℃, 10% of Rated Voltage
at +85℃, 5% of Rated Voltage

or 1V, whichever is greater.

7. DC Leakage Current (DCL)

Refer to part number tables for maximum leakage current limits.
DC leakage current is the current that, after a one- to five-minute charging period, flows through a capacitor when voltage is applied. Leakage is measured at +25℃ with full rated DC voltage applied to the capacitor through a 1000 ohm resistor in series with the capacitor.
DC leakage current is affected both by applied voltage and by temperature, as shown in Figure 2 and 3.

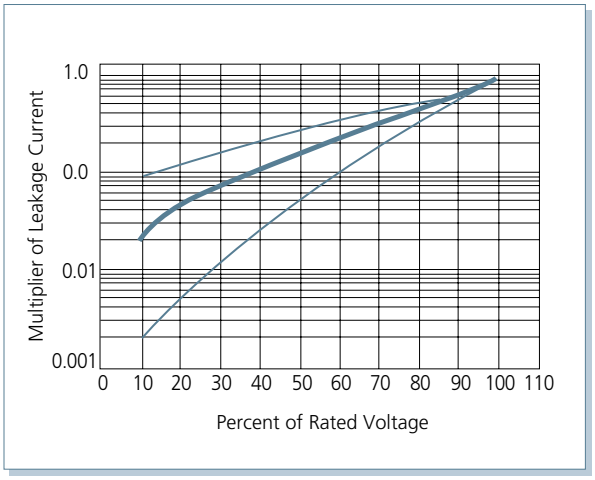


Figure 2 Voltage vs DC Leakage Current

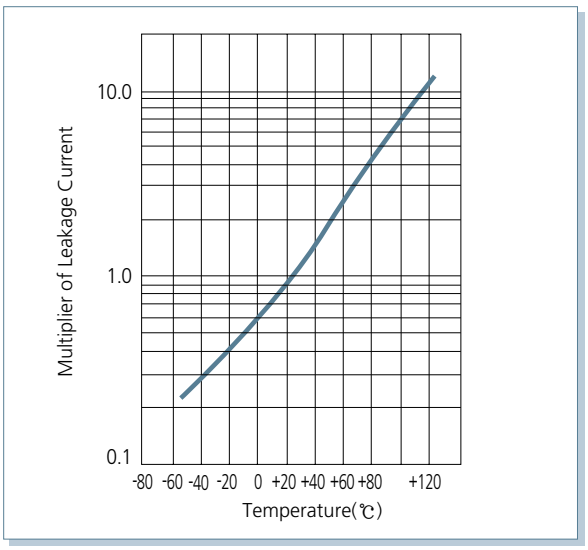


Figure 3 Temperature vs DC Leakage Current

8. Dissipation Factor (DF)

Refer to part number tables for maximum DF limits.
Dissipation factor is measured at 120 Hz, up to 1.0 volt rms maximum, and up to 1.5 volts DC maximum at +25℃.
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 (Figure 4).

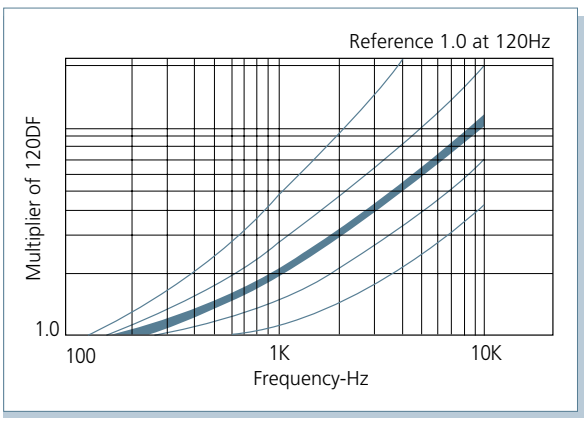


Figure 4 Normal Effect of Frequency upon Dissipation Factor

Dissipation factor is a very useful low frequency (120 Hz) 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.

$$DF = \frac{R}{X_C} = 2\pi f C R$$

where DF = Dissipation Factor
R = Equivalent Series Resistance (Ohms)
Xc = Capacitive Reactance (Ohms)
f = Frequency (Hertz)
C = Series Capacitance (Farads)

DF is also referred to as tan δ or "loss tangent."
The "Quality Factor," "Q," is the reciprocal of DF. DF increases with temperature above +25℃ 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.

9. Equivalent Series Resistance (ESR) and Impedance (Z)

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.
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).

$$X_C = \frac{R}{2\pi f C} \text{ ohm}$$

where:
f = frequency, Hertz
C = capacitance, Farad

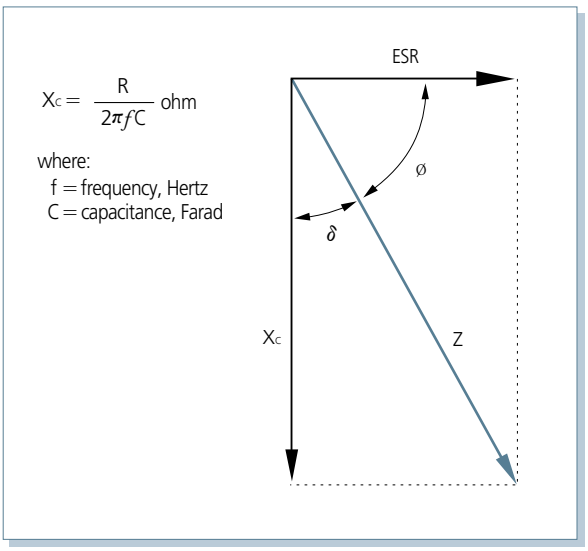


Figure 5 Total Impedance of the Capacitor Below Resonance

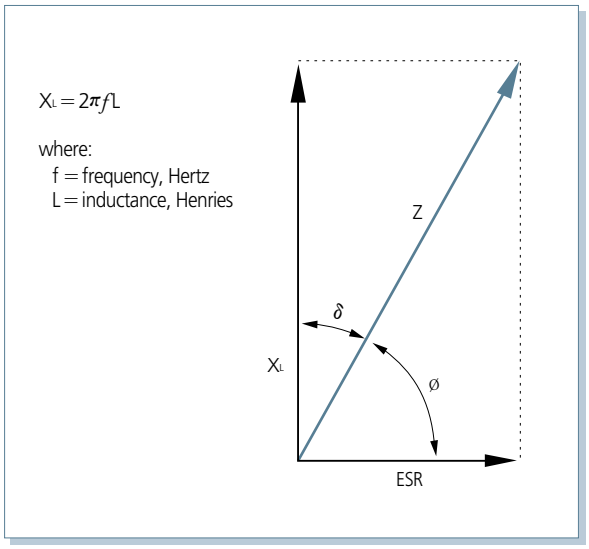


Figure 6 Total Impedance of the Capacitor Above Resonance

Typical impedance versus frequency curve is shown in Figure 7.

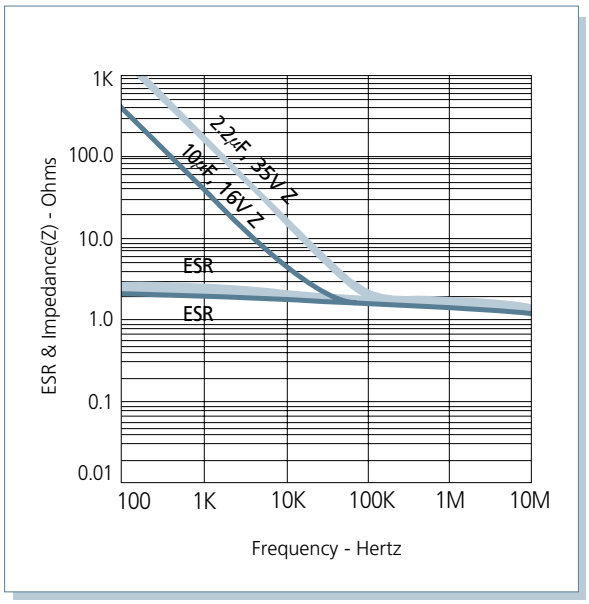
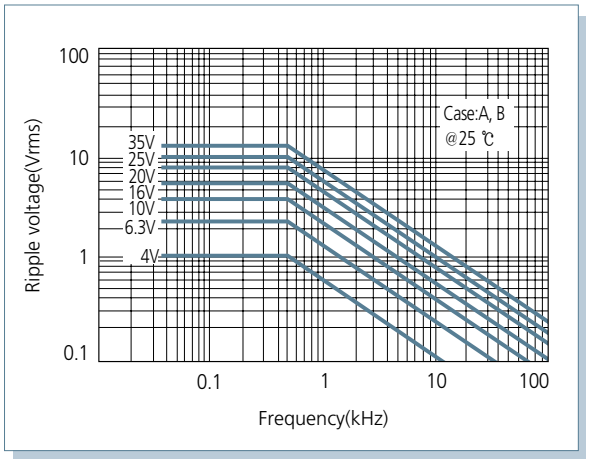


Figure 7 ESR & Impedance (Z) vs Frequency

Permissible voltage at 50℃
= 0.7 × Permissible voltage at 25℃
Permissible voltage at 85℃
= 0.5 × Permissible voltage at 25℃
Permissible voltage at 125℃
= 0.3 × Permissible voltage at 25℃



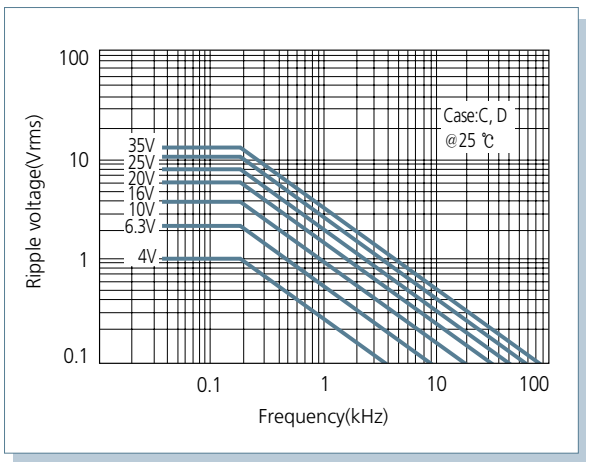


Figure 8 Permissible Ripple Voltage vs Frequency

10. Ripple Voltage

The sum of DC voltage and peak ripple voltage should not exceed the rated DC working voltage of the capacitor.
This is based on an ambient temperature of 25℃.
For higher temperatue, permissible ripple voltage shall be derated as follows.

ENVIRONMENTAL

11. Temperature Stability

Table 1 Temperature Stability Limits

Step No.	Temp	⊿Capacitance	Leakage Current	Dissipation Factor
1	+20℃	within specified tolerance	within original limit	within original limit
2	-55℃	-10 to 0% of initial value	N/A	within original limit
3	+20℃			
4	+85℃	0 to +10% of initial value	0.1CV or 5μA, Whichever is greater	1.0μF↓: 8% 1.5μF↑: 10%
5	+125℃	0 to +15% of initial value	0.125CV or 6.25μA, Whichever is greater	1.0μF↓: 10% 1.5μF↑: 12%
6	+20℃	within +10% of initial value	within original limit	within original limit

Capacitors withstand extreme temperature testing at a succession of continuous steps at +25℃, -55℃, +25℃, +85℃, +125℃, +25℃, in the order stated. Capacitors shal be brought to thermal stability at each test temperature.
Capacitance, DF, and DLC are measured at each test temperature except that DLC is not measured at -55℃.

RELIABILITY

12. Reliability Prediction

Solid tantalum capaciotrs 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 Monograph(Figure 9).
The monograph relates failure rate to voltage and temperature while the table relates failure rate to impedance.
These estimates apply to steady-state DC conditions, and they assume usage within all other rated conditions.
Standard conditions, which produce a unity failure rate factor, are rated voltage, +85℃, 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.

The maximum failure rate in the field is estimated by following expression:

$$\lambda = \lambda_0 \left(\frac{V}{V0}\right)^3 \times 2\left(\frac{T-T0}{10}\right)$$

where,
λ : Maximum field failure rate
λ_0 : 1% / 1,000 hour (The failure rate at the full rated DC WV at operating temperature of 85℃ and series resistance of 3Ω)
V : Applied voltage in actual use
V_0 : Rated DC working voltage
T : Operating temperature in actual use
T_0 : 85℃

The monograph is provided for quick estimation of maximum field failure rates. Connect operating temperature T and applied voltage ratio V/V_0 of interest with a straight line. The failure rate multiplier F is given at the intersection of this line with the model scale. The failure rate is obtained as $\lambda = \lambda_0 \cdot F$.
Examples :

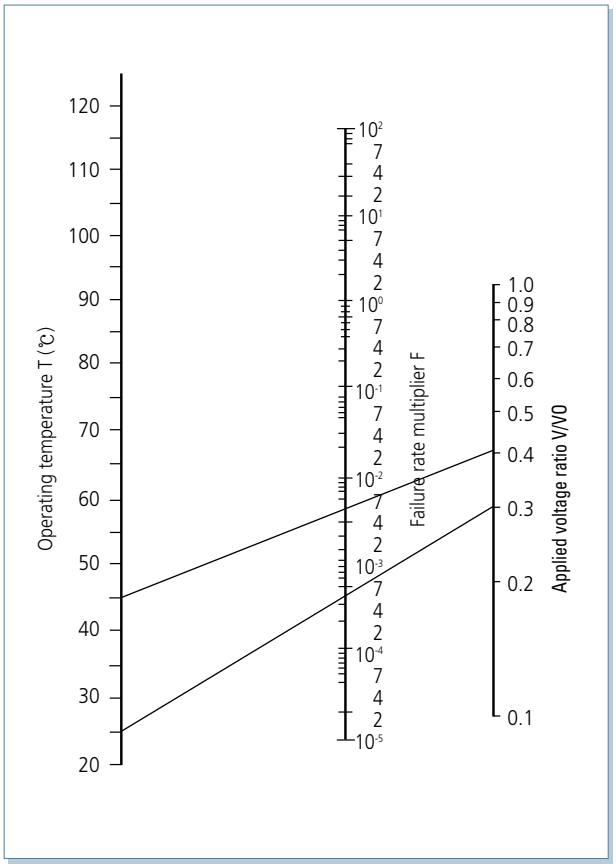


FIGURE 9 Reliability Monograph

Given $V/V_0 = 0.4$ and $T = 45℃$, read
$F = 4 \times 10^{-3}$
Hence, $\lambda = 0.004\%/1{,}000$ hour (40 Fit).
Given $V/V_0 = 0.3$ and $T = 25℃$, read
$F = 4 \times 10^{-4}$
Hence, $\lambda = 0.0004\%/1{,}000$ hour (4 Fit).

13. Standard Life Test

2000 hours, +85℃, Rated Voltage, Mounted Post
Test Performance:

a. Capacitance : within ±10% of initial value
b. DC Leakage : within initial limit
c. Dissipation Factor : within initial limit
d. Physical : no degradation of function

14. High Temperature Life Test

2000 hours, +125℃,2/3 Rated Voltage, Mounted Post
Test Performance:

a. Capacitance : within ±10% of initial value
b. DC Leakage : within initial limit
c. Dissipation Factor : within initial limit
d. Physical : no degradation of function

MECHANICAL

15. Resistance to Soldering Heat

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

a. Wave soldering
230℃ ~ 260℃ 5 seconds or less
b. Reflow soldering
See Figures 10 and 11.

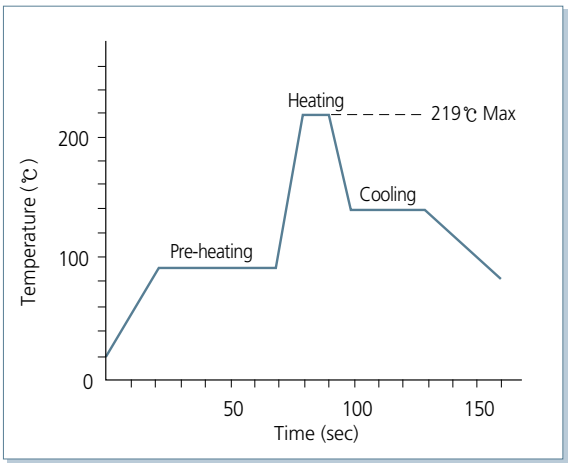


FIGURE 10 Typical Temperature Profile of Vapor Phase Reflow Soldering

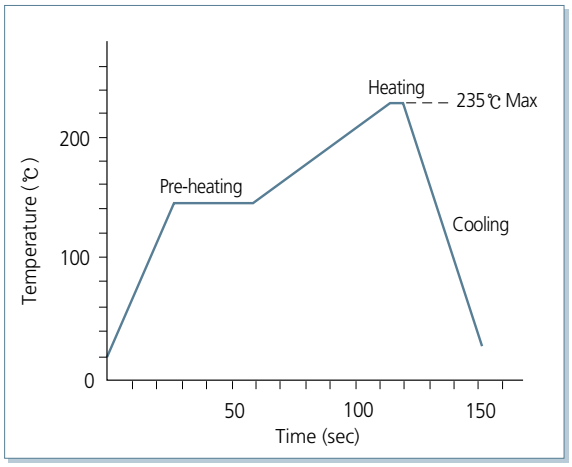


FIGURE 11 Typical Temperature Profile of Infrared Reflow Soldering

16. Solderability

More than 75% of the terminal surface must be soldered newly.

Solder temperature: 230±5℃
Dip time: 3±0.5 seconds
Solder: S63A(KSD 7604)
Flux: Rosin(KSD 2951)

17. Vibration

Frequence: 10 to 55 to 10 Hz (in 1 mim)
Max amplitude : 1.5 mm
Direction of vibration : In directions of X, Y and Z axes
Time: 2 hours each direction and 6 hours in total
During the last 30 min of vibration in each direction, the capacitance sheall be measured 3 to 5 times.

Post Test Performance:
a. Capacitance : within ±5% of initial value
b. DC Leakage : within initial limit
c. Dissipation Factor : within initial limit

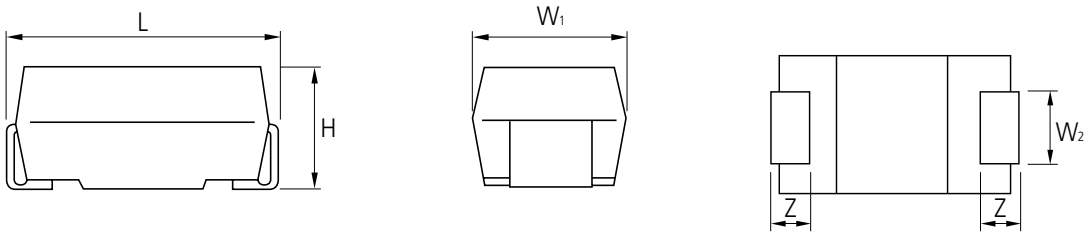
FEATURES

Molded Case available in four case codes.
Compatible with automatic pick and place equipment.
Meets or Exceeds EIA standard 535BAAC

PERFORMANCE / ELECTRICAL CHARACTERISTICS

· Operating Temperature: -55℃ to +85℃(To +125℃ with voltage derating)
· Capacitance Range: 0.15㎌ to 68㎌
· Capacitance Tolerance: ±20%, ±10% standard
· Operating Voltage: 4WVDC to 35WVDC
· Compliant Terminations: 90/10 SnPb finish

Case Dimensions



Unit : mm(inch)

Case Code	L	W1	W2	H	Z
A	3.2±0.2 (0.126±0.008)	1.6±0.2 (0.063±0.008)	1.2±0.1 (0.047±0.004)	1.6±0.2 (0.063±0.008)	0.8±0.3 (0.031±0.012)
B	3.5±0.2 (0.138±0.008)	2.8±0.2 (0.110±0.008)	2.2±0.1 (0.087±0.004)	1.9±0.2 (0.075±0.008)	0.8±0.3 (0.031±0.012)
C	6.0±0.3 (0.236±0.012)	3.2±0.3 (0.126±0.012)	2.2±0.1 (0.087±0.004)	2.5±0.3 (0.098±0.012)	1.3±0.3 (0.051±0.012)
D	7.3±0.3 (0.028±0.012)	4.3±0.3 (0.169±0.012)	2.4±0.1 (0.094±0.004)	2.8±0.3 (0.110±0.012)	1.3±0.3 (0.051±0.012)

Case Size and Rating Voltage

	4(0G)	6.3(0J)	10(1A)	16(1C)	20(1D)	25(1E)	35(1V)
0.15(154)							A
0.22(224)							A
0.33(334)						A	A
0.47(474)				A	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						

How to Order:

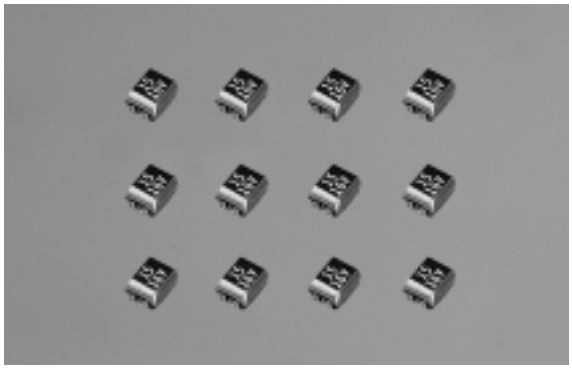
TC SCN 1A 225 M B A R

- **Tantalum Capacitor**
- **Series**
- **Voltage**
- **Capacitance in Picofarads**
- **Capacitance Tolerance**
  K=±10%, M=±20%
- **Case Size**
  A, B, C, D
- **Reel**
  A=7 inches, C=13 inches
- **Taping Direction**

SCN Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA)@+25℃Max.	DF (%)@+25℃Max.	Z (Ω)@+25℃Max.
4 volt Rating@+85℃(2.5 volt Rating@+125℃)					
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℃(4 volt Rating@+125℃)					
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℃(6.3 volt Rating@+125℃)					
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℃(10 volt Rating@+125℃)					
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℃(13 volt Rating@+125℃)					
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
25 volt Rating@+85℃(16 volt Rating@+125℃)					
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℃(22 volt Rating@+125℃)					
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

* Insert K for ±10% tolerance and M for ±20%.



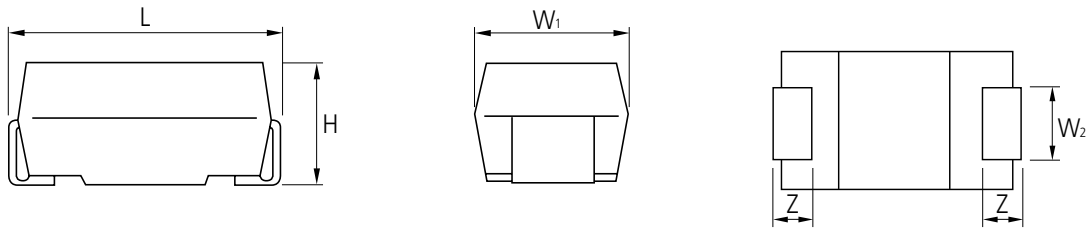
FEATURES

Molded Case available in five case codes.
Extended Range Values.
Compatible with automatic pick and place equipment.
Meets or Exceeds EIA standard 535BAAC
New Low Profile Case Size

PERFORMANCE / ELECTRICAL CHARACTERISTICS

· Operating Temperature: -55℃ to +85℃(To +125℃ with voltage derating)
· Capacitance Range: 0.47㎌ to 220㎌
· Capacitance Tolerance: ±20%, ±10% standard
· Operating Voltage: 4WVDC to 35WVDC
· Compliant Terminations: 90/10 SnPb finish

Case Dimensions



Unit : mm(inch)

Case Code	L	W_1	W_2	H	Z
P	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.049±0.008)	0.9±0.1 (0.035±0.004)	1.2 max (0.047 max)	0.5±0.2 (0.020±0.008)
A	3.2±0.2 (0.126±0.008)	1.6±0.2 (0.063±0.008)	1.2±0.1 (0.047±0.004)	1.6±0.2 (0.063±0.008)	0.8±0.3 (0.031±0.012)
B	3.5±0.2 (0.138±0.008)	2.8±0.2 (0.110±0.008)	2.2±0.1 (0.087±0.004)	1.9±0.2 (0.075±0.008)	0.8±0.3 (0.031±0.012)
C	6.0±0.3 (0.236±0.012)	3.2±0.3 (0.126±0.012)	2.2±0.1 (0.087±0.004)	2.5±0.3 (0.098±0.012)	1.3±0.3 (0.051±0.012)
D	7.3±0.3 (0.028±0.012)	4.3±0.3 (0.169±0.012)	2.4±0.1 (0.094±0.004)	2.8±0.3 (0.110±0.012)	1.3±0.3 (0.051±0.012)

Case Size and Rating Voltage

	4(0G)	6.3(0J)	10(1A)	16(1C)	20(1D)	25(1E)	35(1V)
0.47(474)							A
0.68(684)						A	A
1.0(105)			P	P	A	A	A
1.5(155)				A	A	A	A, B*
2.2(225)			A	A	A	A, B	B
3.3(335)		P, A	A	A	A, B	B	
4.7(475)	A	P, A	A	A, B	B	B	C
6.8(685)	A	A	A, B	B	B	B, C	C
10(106)	A	P, A, B	A, B	B	B, C	C	D
15(156)	A, B	B	B	B, C	C	D	D
22(226)	A, B	B	B, C	B, C	D	D	
33(336)	B	B, C	B, C	C, D	D		
47(476)	B, C	B, C	C, D	D			
68(686)	C	D	D				
100(107)	D	C, D	D				
150(157)							
220(227)		D					

■ Standard Range
■ Extended Range
■ Development Range

* Contact factory for availability

How to Order:

TC SCS 0J 106 M A A R

Tantalum Capacitor

Series

Voltage

Capacitance in Picofarads

Capacitance Tolerance
K=±10%, M=±20%

Case Size
P, A, B, C, D

Reel
A=7 inches, C=13 inches

Taping Direction

SCS Ratings & Part Number Reference

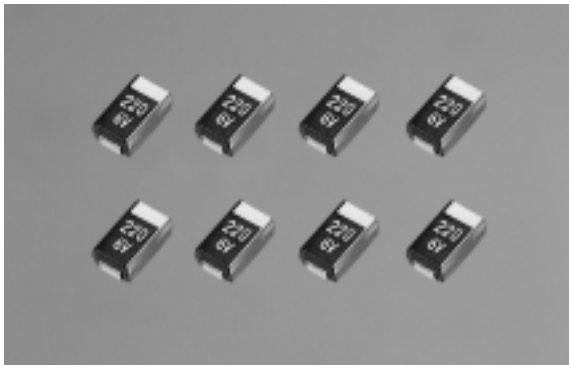
Part Number	Case Size	Capacitance (μF)	DC Leakage (μA)@+25℃Max.	DF (%)@+25℃Max.	Z (Ω)@+25℃Max.
4 volt Rating@+85℃(2.5 volt Rating@+125℃)					
TCSCS0G475*AAR	A	4.7	0.5	8	8.0
TCSCS0G685*AAR	A	6.8	0.5	8	6.0
TCSCS0G106*AAR	A	10	0.5	8	6.0
TCSCS0G156*AAR	A	15	0.6	8	4.0
TCSCS0G156*BAR	B	15	0.6	8	3.5
TCSCS0G226*AAR	A	22	0.9	8	4.0
TCSCS0G226*BAR	B	22	0.9	8	3.5
TCSCS0G336*BAR	B	33	1.3	8	3.5
TCSCS0G476*CAR	C	47	1.9	8	1.8
TCSCS0G686*CAR	C	68	2.7	8	1.6
TCSCS0G107*DAR	D	100	4.0	8	0.8
TCSCS0G227*DAR	D	220	8.8	8	0.7
6.3 volt Rating@+85℃(4 volt Rating@+125℃)					
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*BAR	B	15	0.9	8	3.5
TCSCS0J226*BAR	B	22	1.4	8	3.5
TCSCS0J336*BAR	B	33	2.0	8	3.0
TCSCS0J336*CAR	C	33	2.0	8	1.8
TCSCS0J476*BAR	B	47	3.0	8	3.5
TCSCS0J476*CAR	C	47	3.0	8	1.6
TCSCS0J686*CAR	C	68	4.3	8	1.2
TCSCS0J107*DAR	D	100	6.3	8	0.8
TCSCS0J227*DAR	D	220	13.9	8	0.7
10 volt Rating@+85℃(6.3 volt Rating@+125℃)					
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	1.0	8	4.0
TCSCS1A106*BAR	B	10	1.0	8	3.5
TCSCS1A156*BAR	B	15	1.5	8	3.5
TCSCS1A226*BAR	B	22	2.2	8	3.0
TCSCS1A226*CAR	C	22	2.2	8	1.8
TCSCS1A336*CAR	C	33	3.3	8	1.6
TCSCS1A476*CAR	C	47	4.7	8	1.2
TCSCS1A476*DAR	D	47	4.7	8	0.8
TCSCS1A686*DAR	D	68	6.8	8	0.8
TCSCS1A107*DAR	D	100	10.0	8	0.7
16 volt Rating@+85℃(10 volt Rating@+125℃)					
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	6.0
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*BAR	B	10	1.6	8	3.5
TCSCS1C156*CAR	C	15	2.4	8	1.8
TCSCS1C226*CAR	C	22	3.5	8	1.6
TCSCS1C336*DAR	D	33	5.3	8	0.8
TCSCS1C476*DAR	D	47	7.5	8	0.8

* Insert K for ±10% tolerance and M for ±20%.

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA)@ +25℃Max.	DF (%)@ +25℃Max.	Z (Ω)@ +25℃Max.
20 volt Rating@ +85℃(13 volt Rating@ +125℃)					
TCSCS1D105*AAR	A	1.0	0.5	6	1.0
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	7.0
TCSCS1D335*BAR	B	3.3	0.7	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*DAR	D	22	4.4	8	0.8
TCSCS1D336*DAR	D	33	6.6	8	0.8
25 volt Rating@ 85℃(16 volt Rating@ 125℃)					
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	7.0
TCSCS1E225*BAR	B	2.2	0.6	8	4.5
TCSCS1E335*BAR	B	3.3	0.8	8	3.5
TCSCS1E475*BAR	B	4.7	1.2	8	3.0
TCSCS1E685*CAR	C	6.8	1.7	8	1.9
TCSCS1E106*CAR	C	10	2.5	8	1.5
TCSCS1E156*DAR	D	15	3.7	8	1.0
TCSCS1E226*DAR	D	22	5.5	8	0.8
35 volt Rating@ 85℃(22 volt Rating@ 125℃)					
TCSCS1V474*AAR	A	0.47	0.5	6	14.0
TCSCS1V684*AAR	A	0.68	0.5	6	10.0
TCSCS1V105*AAR	A	1.0	0.5	6	10.0
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*DAR	D	10	3.5	8	1.0
TCSCS1V156*DAR	D	15	5.2	8	0.8

* Insert K for ±10% tolerance and M for ±20%.

SCE Series Low ESR



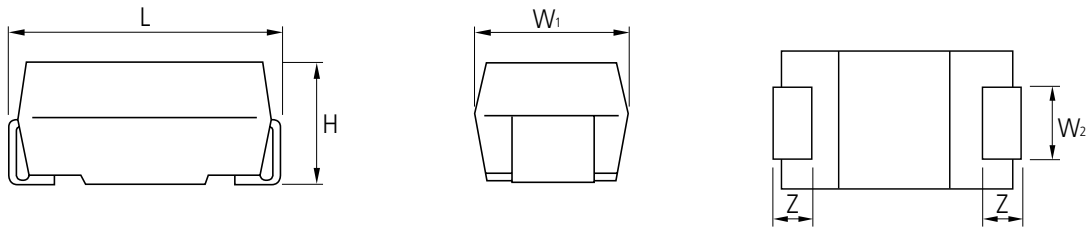
FEATURES

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

PERFORMANCE / ELECTRICAL CHARACTERISTICS

· Operating Temperature: -55℃ to +85℃(To +125℃ with voltage derating)
· Capacitance Range: 0.47㎌ to 220㎌
· Capacitance Tolerance: ±20%, ±10% standard
· Operating Voltage: 4WVDC to 35WVDC
· Compliant Terminations: 90/10 SnPb finish

Case Dimensions



Unit : mm(inch)

Case Code	L	W1	W2	H	Z
A	3.2±0.2 (0.126±0.008)	1.6±0.2 (0.063±0.008)	1.2±0.1 (0.047±0.004)	1.6±0.2 (0.063±0.008)	0.8±0.3 (0.031±0.012)
B	3.5±0.2 (0.138±0.008)	2.8±0.2 (0.110±0.008)	2.2±0.1 (0.087±0.004)	1.9±0.2 (0.075±0.008)	0.8±0.3 (0.031±0.012)
C	6.0±0.3 (0.236±0.012)	3.2±0.3 (0.126±0.012)	2.2±0.1 (0.087±0.004)	2.5±0.3 (0.098±0.012)	1.3±0.3 (0.051±0.012)
D	7.3±0.3 (0.028±0.012)	4.3±0.3 (0.169±0.012)	2.4±0.1 (0.094±0.004)	2.8±0.3 (0.110±0.012)	1.3±0.3 (0.051±0.012)

Case Size and Rating Voltage

	4(0G)	6.3(0J)	10(1A)	16(1C)	20(1D)	25(1E)	35(1V)
0.47(474)						A	
0.68(684)					A	A	
1.0(105)				A	A	A	
1.5(155)				A	A		
2.2(225)		A	A	A	A		B C
3.3(335)		A	A	A B		B	C
4.7(475)		A	A B	A B	B C		C D
6.8(685)	A	A B	A B	B C	B C		D
10(106)	A	A B	A B C	B C	C	C D	D
15(156)	A	B	B C		C D	D	
22(226)	B	B C	C	C D	D	D	
33(336)	C		D	D	D		
47(476)		C D	D	D			
68(686)		D	D				
100(107)		D	D				
150(157)							
220(227)		D					

How to Order:

SOLID TANTALUM SCE SERIES PART NUMBER

TC SCE 0J 107 M D A R 0150

Tantalum Capacitor

Series

Voltage

Capacitance in Picofarade

Capacitance Tolerance
K=±10%, M=±20%

Case Size
A, B, C, D

Reel
A=7 inches, C=13 inches

Taping Direction

Maximum ESR in Milliohms

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

SCE Ratings & Part Number Reference

Part Number	Case Size	Capacitance (μF)	DC Leakage (μA)@ +25℃Max.	DF (%)@ +25℃Max.	ESR (Ω)@ +25℃Max.
4 volt Rating@ 85℃(2.5 volt Rating@ 125℃)					
TCSCE0G685*AAR3000	A	6.8	0.5	8	3.0
TCSCE0G106*AAR2000	A	10	0.5	8	2.0
TCSCE0G156*AAR1500	A	15	0.6	8	1.5
TCSCE0G226*BAR0600	B	22	0.9	8	0.6
TCSCE0G336*CAR0500	C	33	1.3	8	0.5
6.3 volt Rating@ 85℃(4 volt Rating@ 125℃)					
TCSCE0J225*AAR6000	A	2.2	0.5	8	6.0
TCSCE0J335*AAR6000	A	3.3	0.5	8	6.0
TCSCE0J475*AAR3500	A	4.7	0.5	8	3.5
TCSCE0J685*AAR2000	A	6.8	0.5	8	2.0
TCSCE0J685*BAR1200	B	6.8	0.5	8	1.2
TCSCE0J106*AAR2000	A	10	0.6	8	2.0
TCSCE0J106*BAR1500	B	10	0.6	8	1.5
TCSCE0J156*BAR1000	B	15	0.8	8	1.0
TCSCE0J226*BAR0800	B	22	1.3	8	0.8
TCSCE0J226*CAR0500	C	22	1.3	8	0.5
TCSCE0J476*CAR0400	C	47	3.0	8	0.4
TCSCE0J476*DAR0220	D	47	3.0	8	0.22
TCSCE0J686*DAR0200	D	68	4.3	8	0.2
TCSCE0J107*DAR0150	D	100	6.3	8	0.15
TCSCE0J107*DAR0200	D	100	6.3	8	0.2
TCSCE0J227*DAR0150	D	220	13.9	8	0.15
10 volt Rating@ 85℃(6.3 volt Rating@ 125℃)					
TCSCE1A225*AAR6000	A	2.2	0.5	8	6.0
TCSCE1A335*AAR4000	A	3.3	0.5	8	4.0
TCSCE1A475*AAR3000	A	4.7	0.5	8	3.0
TCSCE1A475*BAR1500	B	4.7	0.7	8	1.5
TCSCE1A685*AAR3000	A	6.8	0.7	8	3.0
TCSCE1A685*BAR1200	B	6.8	0.7	8	1.2
TCSCE1A106*AAR2000	A	10	1.0	8	2.0
TCSCE1A106*BAR1000	B	10	1.0	8	1.0
TCSCE1A106*CAR0800	C	10	1.0	8	0.8
TCSCE1A156*BAR0700	B	15	1.5	8	0.7
TCSCE1A156*CAR0500	C	15	1.5	8	0.5
TCSCE1A226*CAR0400	C	22	2.2	8	0.4
TCSCE1A336*DAR0250	D	33	3.3	8	0.25
TCSCE1A476*DAR0220	D	47	4.7	8	0.22
TCSCE1A686*DAR0200	D	68	6.8	8	0.2
TCSCE1A107*DAR0100	D	100	10.0	8	0.1
TCSCE1A107*DAR0150	D	100	10.0	8	0.15
16 volt Rating@ 85℃(10 volt Rating@ 125℃)					
TCSCE1C105*AAR6000	A	1.0	0.5	4	6.0
TCSCE1C155*AAR6000	A	1.5	0.5	8	6.0
TCSCE1C225*AAR4000	A	2.2	0.5	8	4.0
TCSCE1C335*AAR4000	A	3.3	0.5	8	4.0
TCSCE1C335*BAR2000	B	3.3	0.5	8	2.0
TCSCE1C475*AAR3000	A	4.7	0.7	8	3.0
TCSCE1C475*BAR1500	B	4.7	0.7	8	1.5
TCSCE1C685*BAR1200	B	6.8	1.0	8	1.2
TCSCE1C685*CAR0800	C	6.8	1.0	8	0.8
TCSCE1C106*BAR1000	B	10	1.6	8	1.0
TCSCE1C106*CAR0600	C	10	1.6	8	0.6
TCSCE1C226*CAR0400	C	22	3.5	8	0.4
TCSCE1C226*DAR0300	D	22	3.5	8	0.3
TCSCE1C336*DAR0300	D	33	5.3	8	0.3
TCSCE1C476*DAR0200	D	47	7.5	8	0.2

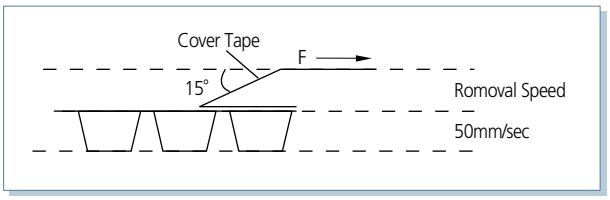
Part Number	Case Size	Capacitance (μF)	DC Leakage (μA)@ +25℃Max.	DF (%)@ +25℃Max.	ESR (Ω)@ +25℃Max.
20 volt Rating@ 85℃(13 volt Rating@ 125℃)					
TCSCE1D684*AAR8000	A	0.68	0.5	4	8.0
TCSCE1D105*AAR5500	A	1.0	0.5	8	5.5
TCSCE1D155*AAR4500	A	1.5	0.5	8	4.5
TCSCE1D225*AAR4000	A	2.2	0.5	8	4.0
TCSCE1D475*BAR1500	B	4.7	1.0	8	1.5
TCSCE1D475*CAR0600	C	4.7	1.0	8	0.6
TCSCE1D685*BAR1500	B	6.8	1.4	8	1.5
TCSCE1D685*CAR0600	C	6.8	1.4	8	0.6
TCSCE1D106*CAR0500	C	10	2.0	8	0.5
TCSCE1D156*CAR0400	C	15	3.0	8	0.4
TCSCE1D156*DAR0400	D	15	3.0	8	0.4
TCSCE1D226*DAR0300	D	22	4.4	8	0.3
TCSCE1D336*DAR0300	D	33	6.6	8	0.3
25 volt Rating@ 85℃(16 volt Rating@ 125℃)					
TCSCE1E474*AAR9000	A	0.47	0.5	4	9.0
TCSCE1E684*AAR6000	A	0.68	0.5	6	6.0
TCSCE1E105*AAR4000	A	1.0	0.5	8	4.0
TCSCE1E335*BAR2000	B	3.3	0.8	8	2.0
TCSCE1E106*CAR0600	C	10	2.5	8	0.6
TCSCE1E106*DAR0400	D	10	2.5	8	0.4
TCSCE1E156*DAR0400	D	15	3.7	8	0.4
TCSCE1E226*DAR0300	D	22	5.5	8	0.3
35 volt Rating@ 85℃(22 volt Rating@ 125℃)					
TCSCE1V225*BAR2500	B	2.2	0.7	8	2.5
TCSCE1V335*CAR0800	C	3.3	1.1	8	0.8
TCSCE1V475*CAR1000	C	4.7	1.6	8	1.0
TCSCE1V475*DAR1000	D	4.7	1.6	8	1.0
TCSCE1V685*DAR0500	D	6.8	2.3	8	0.5

* Insert K for ±10% tolerance and M for ±20%.

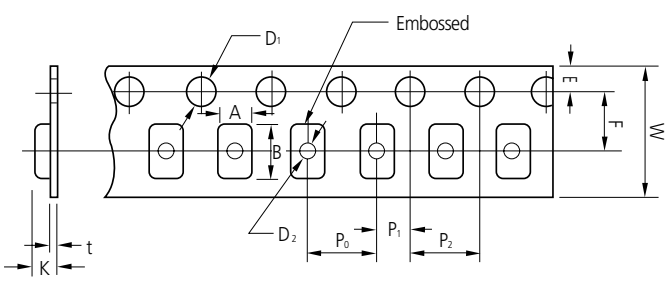
PACKAGING INFORMATION

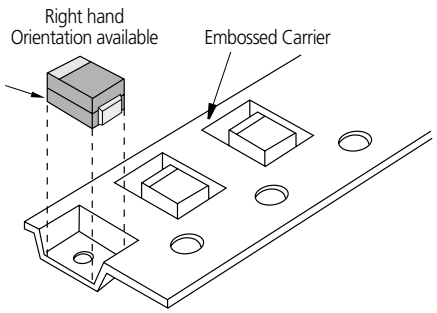
SAMSUNG' s Molded Tantalum Chip Capacitors are packaged in 8mm and 12mm plastic tape on 7" and 13" reels, in accordance with EIA Standard.

The tension of removing the cover tape : F=10 ~70g



CARRIER TAPE DIMENSION

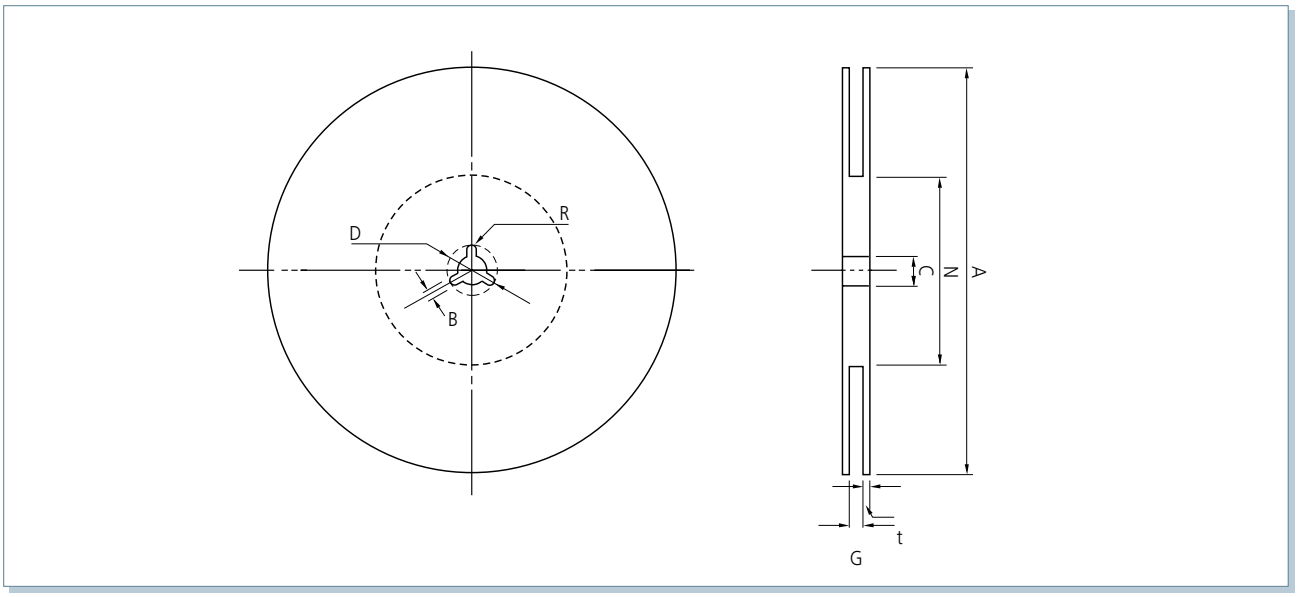




Unit : mm(inch)

Case Code	W±0.3 (±0.012)	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)
P	8 (0.315)	3.5 (0.138)	1.75 (0.069)	4 (0.157)	2 (0.079)	4 (0.157)	Ø 1.5 (0.059)	Ø 1.0 (0.039)	0.2 (0.008)	1.4 (0.055)	2.3 (0.091)	1.4 (0.055)
A										1.9 (0.075)	3.5 (0.138)	1.9 (0.075)
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)	0.3 (0.012)	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)

REEL DIMENSION



Unit : mm(inch)

Tape Width	A±2 (±0.079)	N Min.	C±0.5 (±0.020)	D±0.5 (±0.020)	B±0.51 (±0.020)	G^{+2}_{-1} ($^{+0.079}_{-0.039}$)	t±0.5 (±0.020)	R
8mm	ø 178 (7)	ø 50 (1.969)	ø 13 (0.512)	ø 21 (0.827)	2 (0.079)	10 (0.394)	2 (0.079)	0.99 (0.039)
12mm						14 (0.551)		
8mm	ø 330 (13)	ø 80 (3.150)	ø 13 (0.512)	ø 21 (0.827)	2 (0.079)	10 (0.394)	2 (0.079)	0.99 (0.039)
12mm						14 (0.551)		

Quantity per Reel

Case Code	Dia. 178mm	Dia. 330mm
P	3,000 pieces / Reel	
A, B	2,000 pieces / Reel	8,000 pieces / Reel
C, D	500 pieces / Reel	2,500 pieces / Reel

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