CA SERIES

SOLID TANTALUM CAPACITOR

AXIAL SOLID TANTALUM CAPACITOR ▲ THT type
Hermetically sealed package
Meets or exceeds Standard GB9583-88
Low leakage current
High thermal stability
Extremely long life

SPECIFICATION

Item		Characteristics [Note 1]								
Related Documents		GB9583-88								
Rated Temperature Range [Note 2]		-55°C to +125°C								
Capacitance Range	C_R	0.1µF to 470µF								
Capacitance Tolerance	ΔC	±10% ▲ ±20%								
Rated Voltage Range	V_R	6.3V_{DC} to 100V_{DC}								
Dissipation Factor	tan δ	-55°C	6 to 15%							
		+20°C	4 to 12%							
		+85°C	6 to 15%							
		+125°C	6 to 15%							
Leakage Current [Note 3]	I_{LEAK}	Less than 0.01 x C_R x V_R or 1µA (whichever is greater)								
Rated Voltage ≤ 85°C	V_R	6.3V	10V	16V	25V	32V	40V	63V	75V	100V
Derated Voltage > 85°C to ≤ 125°C	V_C	4V	6.3V	10V	16V	20V	25V	40V	63V	75V

Case Sizes	Size/Code	Diameter	Length	Lead Length	Lead Diameter
	1	3.2mm	8.0mm	35.0mm	0.8mm
	2	5.0mm	12.0mm	35.0mm	0.8mm
	3	6.0mm	14.0mm	35.0mm	0.8mm
	4	8.0mm	14.0mm	35.0mm	0.8mm
	5	8.0mm	22.0mm	35.0mm	0.8mm

Notes:

1: **All technical data measured at 25°C**
2: **Above 85°C voltage derating is required**
3: **The leakage current should be measured after 5 minutes application of rated voltage at 85°C. 125°C with voltage derating.**

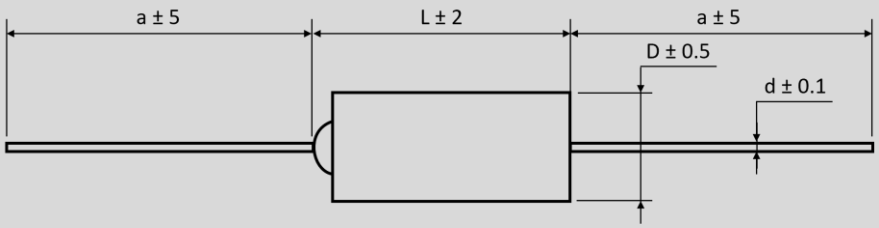
APPLICATIONS

Communication Equipment	Instrumentation	Outdoor Applications	Test Equipment
			

PACKAGE OUTLINE AND CASE DIMENSIONS

Case Code	D (mm)	a (mm)	L (mm)	d (mm)
1	3.2	35.0	8.0	0.40
2	5.0	35.0	12.0	0.60
3	6.0	35.0	14.0	0.60
4	8.0	35.0	14.0	0.80
5	8.0	35.0	22.0	0.80

Package Outline



CAPACITOR RATINGS AND CASE CODES

C_R (µF)	Capacitance Code	Rated Voltage V_R at 85°C (V)								
		6.3	10	16	25	32	40	63	75	100
0.10	104									1
0.15	154									1
0.22	224					1	1	1	1	1
0.33	334			1	1	1	1	1	1	2
0.47	474			1	1	1	1	1	2	2
0.68	684		1	1	1	1	1	2	2	2
1.0	105	1	1	1	1	1	1	2	2	2
1.5	155	1	1	1	1	1	2	2	2	2
2.2	225	1	1	1	1	2	2	2	2	3
3.3	335	1	1	1	2	2	2	2	3	3
4.7	475	1	1	2	2	2	2	3	3	4
6.8	685	1	1	2	2	2	2	4	4	4
10	106	1	2	2	2	2	3	4	4	5
15	156	2	2	2	2	3	3	5	5	
22	226	2	2	2	3	4	4	5		
33	336	2	2	2	3	4	4			
47	476	2	2	3	4	5	5			
68	686	2	3	3	4	5				
100	107	3	3	4	5					
150	157	4	4	5						
220	227	4	5	5						
330	337	5	5							
470	477	5								

ELECTRICAL CHARACTERISTICS

V_R	C_R (µF)	Case Code	Max. I_{LEAK} (µA) Note 1	Max. tanδ (%) Note 1	Part Number Note 2
6.3V_{DC} (at 85°C) ▲ 4V_{DC} (at 125°C)	1.0	1	1	4□	CA-105/6.3V□
	1.5	1	1.5	6	CA-155/6.3V□
	2.2	1	1	6	CA-225/6.3V□
	3.3	1	1	6	CA-335/6.3V□
	4.7	1	1	6	CA-475/6.3V□
	6.8	1	1	6	CA-685/6.3V□
	10	1	1	6	CA-106/6.3V□
	15	2	1	6	CA-156/6.3V□
	22	2	1.4	6	CA-226/6.3V□
	33	2	2.1	6	CA-336/6.3V□
	47	2	3	6	CA-476/6.3V□
	68	2	4.3	6	CA-686/6.3V□
	100	3	6.3	10	CA-107/6.3V□
	150	4	9.5	10	CA-157/6.3V□
	220	4	13.9	10	CA-227/6.3V□
	330	5	20.8	10	CA-337/6.3V□
	470	5	29.6	12	CA-477/6.3V□
10V_{DC} (at 85°C) ▲ 6.3V_{DC} (at 125°C)	0.68	1	1	4	CA-684/10V□
	1.0	1	1	4	CA-105/10V□
	1.5	1	1	6	CA-155/10V□
	2.2	1	1	6	CA-225/10V□
	3.3	1	1	6	CA-335/10V□
	4.7	1	1	6	CA-475/10V□
	6.8	1	1	6	CA-685/10V□
	10	2	1	6	CA-106/10V□
	15	2	1.5	6	CA-156/10V□
	22	2	2.2	6	CA-226/10V□
	33	2	3.3	6	CA-336/10V□
	47	2	4.7	6	CA-476/10V□
	68	3	6.8	6	CA-686/10V□
	100	3	10	10	CA-107/10V□
	150	4	15	10	CA-157/10V□
	220	5	22	10	CA-227/10V□
	330	5	33	10	CA-337/10V□
16V_{DC} (at 85°C) ▲ 10V_{DC} (at 125°C)	0.33	1	1	4	CA-334/16V□
	0.47	1	1	4	CA-474/16V□
	0.68	1	1	4	CA-684/16V□
	1.0	1	1	4	CA-105/16V□
	1.5	1	1	6	CA-155/16V□
	2.2	1	1	6	CA-225/16V□
	3.3	1	1	6	CA-335/16V□
	4.7	2	1	6	CA-475/16V□
	6.8	2	1.1	6	CA-685/16V□
	10	2	1.6	6	CA-106/16V□
	15	2	2.4	6	CA-156/16V□
	22	2	3.5	6	CA-226/16V□

Note: 1 **All technical data measured at 25°C. Capacitance and loss test conditions: V = 1.7 to 2.2V, $V_{partial}$ = 0 to 1V (RMS), Measurement frequency: 100 (120)Hz. The leakage current should be measured after 5 minutes application of rated voltage at 85°C. 125°C with voltage derating.**

2 **□: Enter the appropriate capacitance tolerance code. K for ±10% or M for ±20%.**

ELECTRICAL CHARACTERISTICS

V_R	C_R (µF)	Case Code	Max. I_{LEAK} (µA) Note 1	Max. tanδ (%) Note 1	Part Number
16V_{DC} (at 85°C) ▲ 10V_{DC} (at 125°C)	33	2	5.3	6	CA-336/16V□
	47	3	7.5	6	CA-476/16V□
	68	3	10.9	6	CA-686/16V□
	100	4	16	10	CA-107/16V□
	150	5	24	10	CA-157/16V□
	220	5	35.2	10	CA-227/16V□
25V_{DC} (at 85°C) ▲ 16V_{DC} (at 125°C)	0.33	1	1	4	CA-334/25V□
	0.47	1	1	4	CA-474/25V□
	0.68	1	1	4	CA-684/25V□
	1.0	1	1	4	CA-105/25V□
	1.5	1	1	6	CA-155/25V□
	2.2	1	1	6	CA-225/25V□
	3.3	2	1	6	CA-335/25V□
	4.7	2	1.2	6	CA-475/25V□
	6.8	2	1.7	6	CA-685/25V□
	10	2	2.5	6	CA-106/25V□
	15	2	3.8	6	CA-156/25V□
	22	3	5.5	6	CA-226/25V□
	33	3	8.3	6	CA-336/25V□
	47	4	11.8	6	CA-476/25V□
	68	4	17	6	CA-686/25V□
	100	5	25	10	CA-107/25V□
32V_{DC} (at 85°C) ▲ 20V_{DC} (at 125°C)	0.22	1	1	4	CA-224/32V□
	0.33	1	1	4	CA-334/32V□
	0.47	1	1	4	CA-474/32V□
	0.68	1	1	4	CA-684/32V□
	1.0	1	1	4	CA-105/32V□
	1.5	1	1	6	CA-155/32V□
	2.2	2	1	6	CA-225/32V□
	3.3	2	1.1	6	CA-335/32V□
	4.7	2	1.5	6	CA-475/32V□
	6.8	2	2.2	6	CA-685/32V□
	10	2	3.2	6	CA-106/32V□
	15	3	4.8	6	CA-156/32V□
	22	4	7	6	CA-226/32V□
	33	4	10.6	6	CA-336/32V□
	47	5	15	6	CA-476/32V□
	68	5	21.8	6	CA-686/32V□
40V_{DC} (at 85°C) ▲ 25V_{DC} (at 125°C)	0.22	1	1	4	CA-224/40V□
	0.33	1	1	4	CA-334/40V□
	0.47	1	1	4	CA-474/40V□
	0.68	1	1	4	CA-684/40V□
	1.0	1	1	4	CA-105/40V□
	1.5	2	1	6	CA-155/40V□
	2.2	2	1	6	CA-225/40V□
	3.3	2	1.3	6	CA-335/40V□

Note: 1 **All technical data measured at 25°C. Capacitance and loss test conditions: V = 1.7 to 2.2V, $V_{partial}$ = 0 to 1V (RMS), Measurement frequency: 100 (120)Hz. The leakage current should be measured after 5 minutes application of rated voltage at 85°C. 125°C with voltage derating.**

2 **□ : Enter the appropriate capacitance tolerance code. K for ±10% or M for ±20%.**

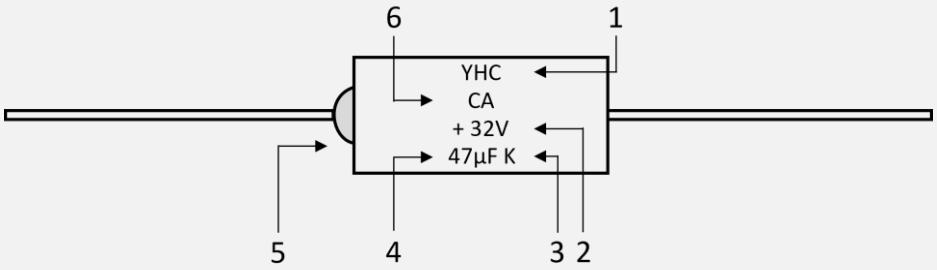
ELECTRICAL CHARACTERISTICS

V_R	C_R (µF)	Case Code	Max. I_{LEAK} (µA) Note 1	Max. tanδ (%) Note 1	Part Number
40V_{DC} (at 85°C) ▲ 25V_{DC} (at 125°C)	4.7	2	1.9	6	CA-475/40V⎕
	6.8	2	2.7	6	CA-685/40V⎕
	10	3	4	6	CA-106/40V⎕
	15	3	6	6	CA-156/40V⎕
	22	4	8.8	6	CA-226/40V⎕
	33	4	13.2	6	CA-336/40V⎕
	47	5	18.8	6	CA-476/40V⎕
63V_{DC} (at 85°C) ▲ 40V_{DC} (at 125°C)	0.22	1	1	4	CA-224/63V⎕
	0.33	1	1	4	CA-334/63V⎕
	0.47	1	1	4	CA-474/63V⎕
	0.68	2	1	4	CA-684/63V⎕
	1.0	2	1	4	CA-105/63V⎕
	1.5	2	1	6	CA-155/63V⎕
	2.2	2	1.4	6	CA-225/63V⎕
	3.3	2	2.1	6	CA-335/63V⎕
	4.7	3	3	6	CA-475/63V⎕
	6.8	4	4.3	6	CA-685/63V⎕
	10	4	6.3	6	CA-106/63V⎕
	15	5	9.5	6	CA-156/63V⎕
	22	5	13.9	6	CA-226/63V⎕
75V_{DC} (at 85°C) ▲ 63V_{DC} (at 125°C)	0.22	1	1	4	CA-224/75V⎕
	0.33	1	1	4	CA-334/75V⎕
	0.47	2	1	4	CA-474/75V⎕
	0.68	2	1	4	CA-684/75V⎕
	1.0	2	1	4	CA-105/75V⎕
	1.5	2	1.1	6	CA-155/75V⎕
	2.2	2	1.7	6	CA-225/75V⎕
	3.3	3	2.5	6	CA-335/75V⎕
	4.7	3	3.5	6	CA-475/75V⎕
	6.8	4	5.1	6	CA-685/75V⎕
	10	4	7.5	6	CA-106/75V⎕
	15	5	11.3	6	CA-156/75V⎕
100V_{DC} (at 85°C) ▲ 63V_{DC} (at 125°C)	0.10	1	1	4	CA-104/100V⎕
	0.15	1	1	4	CA-154/100V⎕
	0.22	1	1	4	CA-224/100V⎕
	0.33	2	1	4	CA-334/100V⎕
	0.47	2	1	4	CA-474/100V⎕
	0.68	2	1	4	CA-684/100V⎕
	1.0	2	1	4	CA-105/100V⎕
	1.5	2	1.5	6	CA-155/100V⎕
	2.2	3	2.2	6	CA-225/100V⎕
	3.3	3	3.3	6	CA-335/100V⎕
	4.7	4	4.7	6	CA-475/100V⎕
	6.8	4	6.8	6	CA-685/100V⎕
	10	5	10	6	CA-106/100V⎕

Note: **1** **All technical data measured at 25°C. Capacitance and loss test conditions: V = 1.7 to 2.2V, $V_{partial}$ = 0 to 1V (RMS), Measurement frequency: 100 (120)Hz. The leakage current should be measured after 5 minutes application of rated voltage at 85°C. 125°C with voltage derating.**

2 **⎕ : Enter the appropriate capacitance tolerance code. K for ±10% or M for ±20%.**

PRODUCT MARKING

Marking	Details	
Example CA ▲ 47µF ▲ 32V ▲ ± 10%	**No.**	**Description**
	1	Logo
	2	Rated voltage
	3	Tolerance (Code)
	4	Capacitance value
	5	Polarity (+) Anode side
	6	Series

PRODUCT CODE

Example: CA series ▲ 47µF ▲ 32V_{DC} ▲ ±10%

CA-	476	/32V	K
Series	Capacitance Code Note1 (pF)	Rated Voltage (V_{DC})	Capacitance Tolerance (%)

Code	Series	Code	µF	Code	VDC	Code	Tol.
CA-	CA	104	0.1	/6.3V	6.3	K	±10
		684	0.68	/10V	10	M	±20
		105	1	/16V	16		
		685	6.8	/25V	25		
		106	10	/32V	32		
		226	22	/40V	40		
		337	330	/63V	63		
		477	470	/100V	100		

Note: 1 Capacitance code expressed in pF. The first two digits represent significant figures. The last digit specifies the total number of zeros to be added.

TECHNICAL SPECIFICATION

No.	Category	Specification	
1	Scope	This specification applies to AXIAL SOLID TANTALUM CAPACITORS for electronics applications. Reference standards: GB9583-88	
2	Product Name	Solid tantalum capacitors, Type CA	
3	Testing Conditions	Room temperature	15 to 35°C
		Relative humidity	45% to 85%
		Air pressure	800mbar to 1060mbar
4	Handling	It is mandatory to fully discharge capacitor to avoid failure test results. The product is a polarized component. It is prohibited to connect positive poles and negative poles reversely to avoid product performance failure.	

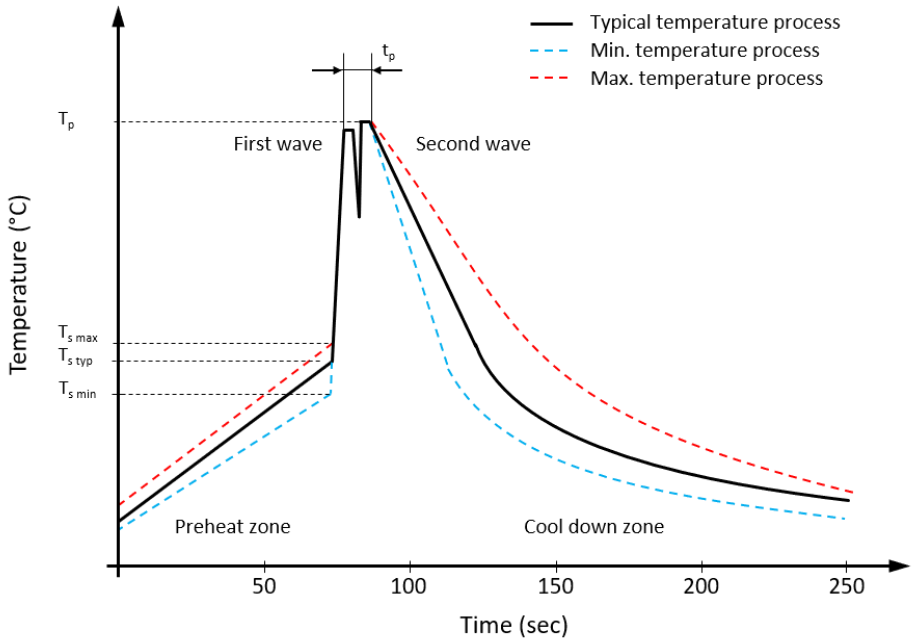
5 Checking List

Item	Characteristics		Testing Method
Drawing and dimension	See package outline and case dimensions		Measured with Vernier Caliper 150 x 0.01mm
Appearance	Correct marking, clear, no pinhole, no burr, no damage		Visual examination
Leakage current (I_{LEAK})	Less than 0.01·C·V or 1μA (whichever is greater)		DC leakage current is the current that, after 5 minutes charging period, flows through a capacitor when voltage measures at 25°C with rated DC voltage applied to the capacitor in series connection with 1kΩ resistor. Read value.
Capacitance tolerance (ΔC)	± 10% (K); ± 20% (M)		Measurement frequency: 100Hz Voltage: 0.3 ± 0.02V
Dissipation factor (tan δ)	C_R: ≤ 1μF	tanδ ≤ 4%	Measurement frequency: 100Hz Voltage: 0.3 ± 0.02V
	C_R: 1.5 to 68μF	tanδ ≤ 6%	
	C_R: 100 to 330μF	tanδ ≤ 10%	
	C_R: 470μF	tanδ ≤ 12%	
Solderability	Soldering coverage rate ≥ 95%		Solder temperature: 235 ± 5°C Immersion time: 2 ± 0.5s

Temperature performance

Capacitance (μF)	Change of Capacitance (ΔC) (%)			Max. tan δ (%)				Max. I_{LEAK} (μA)	
	-55°C	+85°C	+125°C	-55°C	+20°C	+85°C	+125°C	+85°C	+125°C
≤ 1.0	±8	±8	±12	6	4	6	6	$8 \cdot I_{LEAK\_25°C}$	$10 \cdot I_{LEAK\_25°C}$
1.5 to 68				8	6	8	8		
100 to 330				12	10	12	12		
470				15	12	15	15		

RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



Profile Features		Value ▪ Sn-Pb Assembly	Value ▪ Pb-free Assembly
Preheat temperature min.	$T_{s\,min}$	100 °C	100 °C
Preheat temperature typical	$T_{s\,typ}$	120 °C	120 °C
Preheat temperature max.	$T_{s\,max}$	130 °C	130 °C
Preheat time t_s from $T_{s\,min}$ to $T_{s\,max}$	t_s	70 seconds	70 seconds
Peak temperature	T_p	235 °C to 260 °C	245 °C to 260 °C
Time of actual peak temperature	t_p	Max. 10 seconds Max. 5 second each wave	Max. 10 seconds Max. 5 second each wave
Ramp-down date min.		~ 2 °C/second	~ 2 °C/second
Ramp-down rate typical		~ 3.5 °C/second	~ 3.5 °C/second
Ramp-down rate max.		~ 5 °C/second	~ 5 °C/second
Time 25°C to 25°C		4 minutes	4 minutes

SOLDERING SUGGESTIONS

When solder a capacitor, heat in soldering is conducted to the element of the capacitor from wire lead and an enclosure, and hence it should be noted that soldering under high temperature and a long period may cause deterioration of breakdown of capacitors. Be sure to solder within the recommended temperature condition range.

HAND SOLDERING

a.) Soldering iron top temperature: ≤ 350°C

b.) Soldering time: ≤ 3sec

If re-work or dipping twice in necessary, it should be done after the capacitor returned to the normal temperature.

Suggestion time is 24 hours.

THT capacitors are not suitable for reflow soldering.

CORRECT USE OF SOLID TANTALUM CAPACITORS

No.	Category	Specification	
1	Ripple voltage	The ripple voltage that may be applied is limited by two criteria:	
		[a]	The sum of DC voltage and peak value of the ripple voltage must not exceed the rated voltage.
		[b]	The negative peak value of the ripple voltage must not exceed the permissible reverse voltage value specified in the following section, Reverse Voltage.
2	Reverse Voltage	Because the solid tantalum capacitor is a polarized type, do not apply a reverse voltage to it. If reverse voltage cannot be avoided, it must be applied for a short time and must not exceed the following values:	
		25°C	10% max. of rated voltage or $1V_{DC}$, whichever is smaller
		85°C	5% max. of rated voltage or $0.5V_{DC}$, whichever is smaller
		125°C	1% max. of rated voltage or $0.1V_{DC}$, whichever is smaller
		The capacitors should not be operated continuously in reverse mode, even within these limits.	
3	Applied Voltage	(1)	For general application, apply 70% or less of the rated voltage to the capacitor.
		(2)	When the capacitor is used in a power line or a low impedance circuit, keep the applied voltage within 30% of the rated voltage to avoid the adverse influence of inrush current.
		(3)	Derated voltage at 85°C or more.
		(4)	When using a Chip type capacitor at a temperature of 85°C or higher, calculate reduced voltage V_T from the following expression. Note, however, that the ambient temperature must not exceed 125°C $V_T = (V_R - V_C) \cdot \frac{(T - 85°C)}{40°C}$ Where: V_R: Rated voltage (V) at ≤ 85°C V_C: Derated voltage at 125°C (V) V_T: Derated voltage between 85°C to 125°C T: Ambient temperature (°C)
4	Current (Series Resistance)	Reliability of tantalum capacitor is increased by inserting a series resistance of at least 3Ω/V into circuits where current flow is momentary (switching circuit, charge/discharge circuits, etc). If the capacitor is in a low impedance circuit, the voltage applied to the capacitor should be less than 1/2 to 1/3 of DC rated voltage.	
5	Risk of Short Circuit	Manganese oxide tantalum capacitor (conventional tantalum capacitor) is heated and may generate fire and be burned depending upon its excess current, time and other factors. **When design the circuit, provide as much margin as possible to maintain capacitor reliability.**	
6	Product Soldering	See details in our recommended wave soldering profile.	

REVISION TABLE

Revision	Date	Status	Notes
001	26/06/2022	Initial release	Initial publication

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It is subject to the user's duty of care to design and validate his products in such a way that appropriate measures are taken, such as protective circuits or redundant systems to ensure the safety standards required in the application.

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