Hongda Capacitors®
Email: sales@hongdacap.com.hk
Skype: Hongdacapacitors
Web: www.hongdacap.com.hk
Tel: +86 (0)769 82207248

HCA39H Series Wet Tantalum Capacitors--Hermetically Sealed

◆Features:

1. Full tantalum structure, hermetic, cylindrical, axially drawn, polarized capacitor, with excellent electrical properties.
2. Small size, large energy storage, high reliability, long life, and can withstand large ripple current.
3. Optimal 100Hz low-frequency performance, and extreme reliability.
4. Military Standard: GJB733A-96, Aerospace Standard: QJ/PWV319-2010

◆Application:

It excels in high-altitude environments and applications like DC/DC conversion, ECM, and motor control, offering reliability and efficiency. Ideal for aerospace, aviation, weaponry, shipbuilding, and electronics, it's critical for defense equipment (spacecraft, satellites, etc.). Suited for DC/pulsating circuits in military systems with strict reliability needs, especially aerospace-grade gear requiring compact capacitors.

◆Specifications:

1. Operating temperature range: - 55°C ~ + 125°C. Derating design refers to Application Guide 3.1
2. Withstand 1.5V reverse voltage, strong anti-radiation ability
3. Capacitance tolerance: K: ± 10% M: ± 20%
4. Electrical performance parameters such as leakage current, ESR, and low temperature resistance are shown in Table 2
5. Outline structure and installation dimensions: see Figure 1 and Table 1

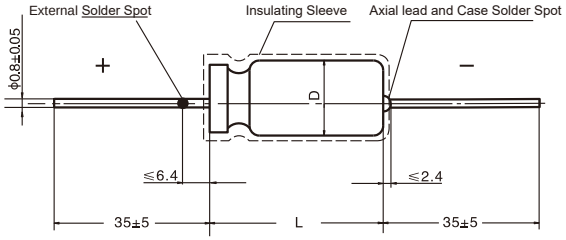

Figure 1

◆How to order:

HCA39H	687	K	050	B	0800	AP
↓	↓	↓	↓	↓	↓	↓
Type	Capacitance code	Tolerance	Rated DC Voltage	Package	ESR in mΩ	Internal Code
HCA39H	pF Code: 1st two digits represent significant figures 3rd digit represents mulitplier (number of zeros to follow) 106 = 10uF 476 = 47uF	K: +/- 10% M: +/-20%	Code 035:35VDC 006 = 6.3VDC 010 = 10VDC 025 = 25VDC 035 = 35VDC 050 = 50VDC	B: Bulk T: Tray Pack	Code 0050: 50mΩ 0050 = 50mΩ 0100 = 100mΩ	AP for aerospace

Table 1 Dimensions and Maximum Weight of Capacitors

Case Code	Max Weight (g)	Without insulating sleeve	
		D±0.4(mm)	$L^{-0.8}_{-0.4}$ (mm)
T1	3.0	4.78	11.51
T2	7.0	7.14	16.28
T3	12.0	9.52	19.46
T4	18.0	9.52	26.97
L4	22.0	9.90	30.0

Note: After the outer case is covered with insulating sleeve, the diameter increases by 0.4mm max and the length L increases by 1.6mm max.

Table 2 Rated voltage, nominal capacitance and main characteristics

Rated voltage (V)	Nominal capacitance (μF)	Case Code	Leakage current(μA)max		Impedance max (Ω) 100Hz	Tg δ max(%)100Hz	Capacitance change(%)			ESR(Ω)max 100Hz	85°C 40kHz Maximum AC Ripple Current (mA)
			25°C max	85°C 125°C	-55°C	25°C	-55°C	85°C	125°C	25°C	
15	150	T1	2	12	30	40	-55	+30	+40	1.4	1400
	680	T2	6	36	13	64	-70	+30	+50	1.1	2200
	1500	T3	12	70	12	85	-80	+40	+60	0.9	2700
	2200	T4	20	120	7	100	-85	+40	+60	0.7	3400
25	120	T1	1	5	25	30	-42	+16	+24	1.3	1250
	560	T2	2	10	12	100	-65	+24	+30	1.0	2100
	1200	T3	5	20	7	125	-70	+24	+36	0.8	2600
	1800	T4	6	25	7	135	-72	+24	+40	0.5	3100
30	100	T1	1	5	30	30	-38	+16	+24	1.6	1200
	470	T2	2	10	18	70	-65	+20	+36	1.1	1800
	1000	T3	7	25	12	100	-70	+20	+36	1.0	2500
	1500	T4	12	35	8	115	-72	+20	+40	0.9	3000
50	68	T1	1	5	35	20	-25	+12	+30	1.8	1050
	220	T2	2	10	18	50	-50	+12	+30	1.2	1800
	470	T3	3	25	14	70	-45	+12	+30	1.1	2100
	680	T4	5	40	9	50	-58	+20	+40	0.8	2750
60	47	T1	1	5	45	15	-25	+10	+24	2.3	1050
	150	T2	2	10	21	25	-40	+10	+24	1.4	1800
	390	T3	3	25	15	50	-45	+10	+24	1.2	2100
	560	T3	10	40	20	80	-60	+25	+70	1.0	2150
	560	T4	5	40	11	35	-58	+10	+24	1.1	2750
63	47	T1	1	5	45	15	-25	+10	+24	2.3	1050
	150	T2	2	10	21	25	-40	+10	+24	1.4	1800
	390	T3	3	25	15	50	-45	+10	+24	1.2	2100
	560	T3	10	40	20	80	-60	+25	+70	1.0	2150
	470	T4	5	40	15	30	-50	+8	+20	1.1	2600
	560	T4	5	40	11	35	-58	+10	+24	1.1	2750
	470	L4	5	32	14	25	-40	+5	+15	1.0	2750
	680	L4	10	60	18	20	-58	+10	+25	0.8	2800
75	33	T1	1	5	55	10	-25	+9	+18	2.8	1050
	110	T2	2	10	35	20	-35	+10	+20	1.6	1650
	330	T3	3	30	21	40	-45	+10	+20	1.3	2100
	470	T4	5	50	13	35	-50	+10	+20	1.2	2750
100	15	T1	1	5	120	10	-18	+3	+10	4.0	1050
	68	T2	2	10	40	20	-30	+4	+12	2.4	1650
	150	T3	3	25	28	25	-35	+6	+12	1.9	2100
	220	T4	5	50	21	35	-40	+6	+12	1.5	2750
	330	L4	10	120	12	20	-45	+10	+20	0.7	2800
125	10	T1	1	5	180	10	-15	+3	+10	6.0	1050
	47	T2	2	10	55	10	-25	+5	+12	2.8	1650
	100	T3	3	25	55	20	-35	+5	+12	2.1	2100
	150	T4	5	50	21	30	-35	+6	+12	1.9	2750
150	100	L4	12	150	40	30	-45	+6	+10	1.5	2600

P.S.: 1. It is forbidden to use a multimeter to measure tantalum capacitors regardless of polarity

2. The test frequency of capacitance and loss tangent is 100Hz, $U_{\_}=2.20^{0}_{-1.0}$ V, $U_{\sim}=1.0^{0}_{-0.5}$ V (effective value): the measurement method adopts series equivalent circuit

3. When measuring the leakage current at 125°C, please apply the category voltage: the leakage current parameter is a 5-minute reading

4. Products with large capacity or special sizes exceeding the standard can be negotiated with our company for production

5. The unit of this model is millimeter (mm)

◆Derated Design guide line:

3.1. Derating Recommendations

3.1.1:

The failure rate of tantalum capacitors is for the DC rating (85°C, rated voltage), and varies with usage conditions (ambient temperature, applied voltage, circuit resistance, etc.). In actual circuits, there are often voltage or current peak impulses and ripple currents, or other unexpected electrical impulses, so derating design is necessary in actual use. Only in this way can the safety and reliability of the circuit be

3.1.2: Rated voltage and derated voltage

The rated voltage (U_R) of tantalum capacitors refers to the maximum DC voltage allowed to be applied to the capacitor at a rated temperature of 85°C. If it is used beyond the rated voltage, the dielectric strength of the dielectric oxide film Ta.0. will be exceeded, which will lead to deterioration of the capacitor performance, and even dielectric breakdown and failure in severe cases.

The environment in which the actual circuit is used is very complex, so in the circuit design, derating design is generally adopted. According to the GJB/Z35 "Component Derating standard", the derating levels of tantalum capacitors are divided into I, II, and III., Class I derating is derated by 50% of the benchmark DC working voltage, class II derating is derated by 60% of the benchmark DC working voltage, and class III derating is derated by 70% of the benchmark DC working voltage.

When the ambient temperature is not more than 85°C, the derated reference DC working voltage is the rated voltage (Ur); when the ambient temperature is more than 85°C, the derated reference DC working voltage is the derated voltage specified in this manual for each model (U_R). Uc). In the derating design, non-solid electrolyte tantalum capacitors and conductive polymer electrolyte tantalum capacitors should be derated at least according to level III. When these two types of tantalum capacitors are used in circuits or filter circuits with high reliability requirements, it is recommended that they should be at least level II Derating; solid electrolyte (manganese dioxide) tantalum capacitors are derated at a minimum of 65% of the reference DC working voltage. When this type of tantalum capacitors are used in circuits or filter circuits with high reliability requirements, it is recommended to derate at least according to class I.

Under the conditions allowed by the design, the derating range should be increased as much as possible. For tantalum capacitors, the larger the derating range, the higher the reliability.

3.2. Reverse voltage

3.2.1:

The dielectric oxide film of tantalum capacitors has unidirectional conductivity and rectifying characteristics. When a reverse voltage is applied, a relatively large current will flow through, which tends to cause potential quality hazards, and in severe cases, may even lead to reverse breakdown and failure of the capacitor. Therefore, the reverse voltage must be strictly controlled during use. The reverse voltage resistance of various types of capacitors is shown in Table 2 below:

3.2.2:

In principle, it's forbidden to use the resistance range of multimeter to perform non-polarity testing on circuits containing tantalum capacitors or the capacitors themselves (reverse voltage can be easily applied). It should be able to withstand reverse testing of the 1.5V power supply of the multimeter if the circuit uses tantalum capacitors with voltage of 35V or above (including 35V), but 9V power supply should be absolutely not allowed.

3.2.3:

In the process of measurement and use, if the tantalum capacitor is accidentally applied to the reverse voltage exceeding the specified value. Even if its electrical parameters are still qualified, the capacitor should be scrapped.
Because the quality hidden danger caused by the reverse voltage of the capacitor has a certain latency period, it may not be manifested at that time.

Table 1 Recommended voltage for various types of products

Executive Standard	Product Type	Series	Recommended voltage	
			-55℃~85℃	85℃~125℃
GJB733	Non-Solid Electrolyte Tantalum Capacitors (Tantalum Case)	HCAK38,HCAK39, HCAK39H,HTHC1 etc.	65%U_R	42%U_R
	Non-solid Electrolyte Tantalum Capacitors (Silver Case)	HCAK35,HCAK86 etc.	65%U_R	42%U_R
GJB63	MnO. Solid Electrolyte Tantalum Capacitors (Metal Case)	HCAK,HCAK- 1 etc.	(50%-60%)U_R	40% U_R
	Polymer Solid Electrolyte Tantalum Capacitors (Metal Case)	HCAK66 etc.	(50%-60%)U_R	40% U_R
GJB2283	MnO. Chip Type Solid Electrolytic Tantalum Capacitor (Molded Plastic Package)	HCAK45,HCAK45L, HCAK45U,HCAK45M etc.	50%U_R	33%U_R
	Chip Polymer Solid Electrolyte Tantalum Capacitor (Molded Plastic Package)	HCAK55,HCAK55H etc.	50%U_R	33% U_R
GJB5437	MnO. Solid Electrolyte Tantalum Capacitors (Molded Plastic)	HCAK44,HCAK41 etc.	50%U_R	33% U_R

3.3. Influence factors of failure rate

3.3.1:

The lower the voltage across the actually added tantalum capacitor is lower than the rated voltage, the lower the failure rate of the tantalum capacitor. The failure rate of tantalum capacitors is evaluated under the maximum allowable load conditions at the rated voltage of 85°C.

3.3.2:

Another factor that affects the failure is the series resistance connected to the outer circuit of the capacitor. The greater the resistance in series with the capacitor in the outer circuit circuit, the lower the failure rate.

Failure rate grade: 2.0%/1000h is expressed as L; 1.0%/1000h is expressed as M; 0.1%/1000h is expressed as P; 0.01%/1000h is expressed as R, 0.001%/1000h is expressed as S.

Table 2 Reverse voltage resistance of various types of products

Executive Standard	Product Type		Series	Withstand reverse voltage
GJB733	Non-Solid Electrolyte Tantalum Capacitors	All tantalum capacitors with tantalum case	HCAK38, HCAK39, HCAK38T etc.	Resistant to 3V reverse voltage
		Hybrid Tantalum Capacitors	HTHC1, HTHC2, HTHC1W, HCAK36S1, HCAK36S1W etc.	Not resistant to reverse voltage
		Silver case	HCAK35, HCAK35X, HCAK86, HCAK81 etc.	Not resistant to reverse voltage
GJB63	Solid Electrolyte Tantalum Capacitors		HCAK, HCAK-1, HCAK-8, HGCA, HGCA411C etc.	Generally, reverse voltage is not allowed, let alone used in pure AC circuits. If it is unavoidable, it is allowed to apply a reverse voltage not greater than the following in a short period of time, and its value is: below 25°C: ≤10%U_R or 1V (whichever is smaller); below 85°C: ≤ 5%U_R or 0.5V (whichever is smaller); below 125°C: ≤1% U_R or 0.1V (whichever is smaller). Note: If the capacitor needs to work in a circuit with reverse voltage for a long time, please use a bipolar tantalum capacitor, but it can only be used in a DC or pulsating circuit with a low frequency of polarity change.
	Polymer Solid Electrolyte Tantalum Capacitors		HCAK66 etc.	Not resistant to reverse voltage
GJB5437	Solid Electrolyte Tantalum Capacitors		HCAK44, HCAK41 etc.	Not resistant to reverse voltage
GJB2283	Chip Tantalum Solid Electrolyte Tantalum Capacitors		HCAK45, HCAK45L, HCAK45U, HCAK45M etc.	Not resistant to reverse voltage
	Chip Polymer Solid Electrolyte Tantalum Capacitors		HCAK55, HCAK55H etc.	Not resistant to reverse voltage

3.4 Ripple Current

3.4.1 The sum of the DC bias and the peak value of the AC partial voltage must not exceed the rated voltage of the capacitor.

3.4.2 The sum of the AC negative peak value and the DC bias must not exceed the allowable reverse voltage of the capacitor.

3.4.3 When ripple current passes through the tantalum capacitor, it produces active power loss, which in turn increases the probability of thermal breakdown failure caused by the capacitor's own temperature rise. Therefore, it is necessary to limit the ripple current through the capacitor or the allowable power loss of the capacitor. The relationship between the power loss (P_{st}) and the ripple current (I_{rms}) is expressed by the following formula: $P_{st}=V\_\times I_{st}+I^2_{rms}\times R=I^2_{rms}\times Rs$

Where: V_ : DC bias (V); I_{st} : Leakage current (uA); Rs: Equivalent series resistance (Ω); I_{rms}: Ripple current (mA).

It can be seen from the above formula that the power loss increases when R_s or I_{rms} increases. Therefore, it is necessary to control the power loss of tantalum capacitors in high-frequency circuits.

3.4.3.1 The allowable power loss of various solid electrolyte tantalum capacitors according to the heat dissipation efficiency of the case size is shown in Table 3.

Table 3 Allowable Power Loss and Temperature Class Coefficient of Solid Electrolyte Tantalum Capacitors

Allowable Power Loss		Temperature Class Coefficient		
Product Structure	Case	Power loss (W)	Temperature (°C)	Class Coefficient
Hermetically Sealed Solid Tantalum Capacitors	A B C D	0.09 0.10 0.125 0.18	25 85 125	1.0 0.9 0.4
	0 1 2 3 4 5 6	0.09 0.09 0.10 0.115 0.12 0.17 0.20		

Allowable Power Loss		Temperature Class Coefficient		
Product Structure	Case	Power loss (W)	Temperature (°C)	Class Coefficient
Molded Chip Solid Tantalum Capacitors	A B C L H D E F V W X G Z S T Y	0.080 0.098 0.114 0.118 0.130 0.157 0.172 0.147 0.212 0.215 0.314 0.321 0.355 0.383 0.429 0.433	25 85 125	1.0 0.6 0.4

Note:
1) The allowable power loss of the capacitor is specified under the condition that the whole machine can normally dissipate heat naturally. When the whole machine is sealed with components, appropriate adjustments should be made due to the reduced heat dissipation conditions.
2) The allowable power loss of similar capacitors can be taken with reference to the case size corresponding to the same surface area.

3.4.3.2 The maximum effective value of ripple current allowed for various non-solid capacitors according to the case size (85°C, 40kHz, 0.66U_R) is shown in Tables 4 and 5. The ripple current coefficient values under different operating voltages, frequencies and temperature conditions are shown in Table 4.

Table 4 Maximum Ripple Current (Effective Value) of HCAK31, HCAK81, HCAK38, HCAK39, HCAK39 Capacitors

Series	HCAK31, HCAK81	HCAK38	HCAK39	HCAK39
Case	I_{rms}(mA)			
T1	50	415	700	1400
T2	200	755	1200	2200
T3	500	1130	1500	2700
T4	600	1800	1900	3400

Table 5 Maximum ripple current (Effective Value) of non-solid electrolytic capacitors

Case	0	1	2	3	4	5	6	7	8
I rms(mA)	40	50	105	280	380	500	600	750	850