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承认书

APPROVAL SHEET

品 名: CA42树脂包封固体电解质钽电容器

客户名称: _____

型号规格: CA42-16V225

客户料号: _____

制作	检查	审批
颜娜	刘虎	赖雨春

客户确认: _____

湖南湘怡中元科技有限公司

HU NAN XIANGYEE ZHONGYUAN TECHNOLOGY COMPANY LIMITED

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CA42型树脂包封固体电解质钽电容器

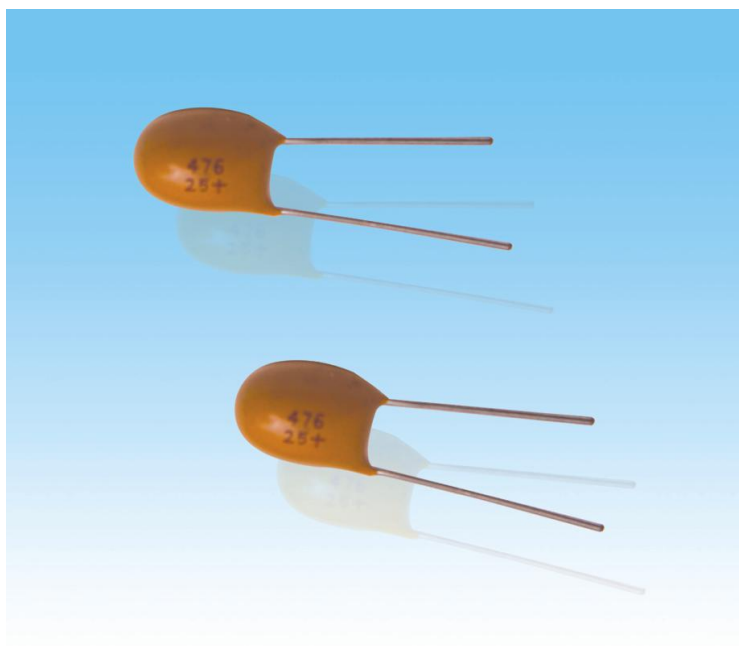
CA42 Series Epoxy-Coated Solid Electrolytic Tantalum Capacitor

CA42 Series

CA42 Dipped Tantalum Capacitors

Features:

- Epoxy-Coated, Radial-lead, Heteropolarity;
- Stable in electrical & storage performances, Small in size, Long life-span, High reliability;
- Applying in TV sets, Telephones, Camcorders, Instruments and Meters, such Electrical Equipments with High-reliable SMT DC & Impulse high-density assembled printed Circuit for Military use;
- Operative Standard: QJ/PWV84-2003
- Ordering Information: CA42-16V2.2 μ F-M: 100 pcs



Technical Performances:

Operating Temperature Range: $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$ (when $>85^{\circ}\text{C}$, with rated voltage derating)

Capacitance Tolerance: K: $\pm 10\%$; M: $\pm 20\%$;

DC Leakage at 25°C : $I_0 \leq 0.01C_R U_R (\mu\text{A})$ or $0.5 \mu\text{A}$ (which is greater)

Dimensions, Rated Voltage, Category Voltage, Nominal Capacitance: See Table 1 & Table 2

Temperature Characteristics: Not exceed the parameter in Table 3

容量范围、壳号 Capacitance Range, Case

额定电压 Rated Voltage (V)	6.3	10	16	20	25	35
降额电压 Derating Voltage (V)	4	6.3	10	13	16	20
浪涌电压 Surge Voltage (V)	8	13	20	26	33	46
标称容量 Nominal Capacitance (μF)						
0.1						A
0.15						A

湘怡中元科技有限公司 XIANGYEE ZHONGYUAN TECHNOLOGY COMPANY LIMITED

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0.22						A
0.33						A
0.47						A
0.68						A
1			A	A	A	A
1.5			A	A	A	A
2.2		A	A	A	A	B
3.3	A	A	A	B	B	B
4.7	A	A	B	B	B	C
6.8	A	B	B	C	C	D
10	B	B	B	C	C	D
15	B	C	C	D	D	E
22	C	C	C	D	D	E
33	C	D	D	E	E	
47	D	D	D	E	E	
68	D	D	E	4.8	7.2	
100	E	E	E	5.5	8	
150	E	E		6.0	9.4	
220	E			7.2	11.5	
				8.2	12.5	

壳型尺寸一览表 Dimensions

壳号 Case	D (±0.3mm)	H (±0.5mm)	L	d (±0.5mm)
A	3.8	6.0	14±1	0.5
B	4.5	7.0	14±1	0.5
C	5.2	8.0	14±1	0.5
D	6.0	9.0	14±1	0.5
E	7.0	11.0	14±1	0.5

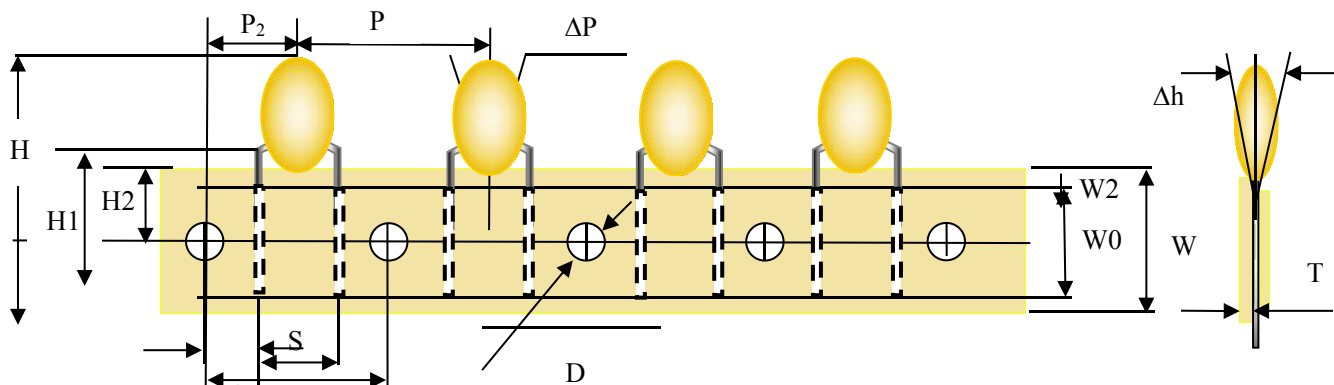
温度特性 Temperature Characteristics

容量 Capacitance(uF)	容量变化 capacitance change (%)			损耗最大值 DF Max (%)				漏电流最大值 DCL Max (uA)		
	-55℃	+85℃	+125℃	-55℃	+20℃	+85℃	+125℃	+20℃	+85℃	+125℃
≤1.0	±8	±12	±15	4	4	6	6	I _o ≤ 0.02CRVR 或 1uA(取 最大值)	10I _o	12.5I _o
1.5-6.8				6	6	8	8			
10-68				8	8	10	10			
100-680				12	10	12	12			

包 装 Package

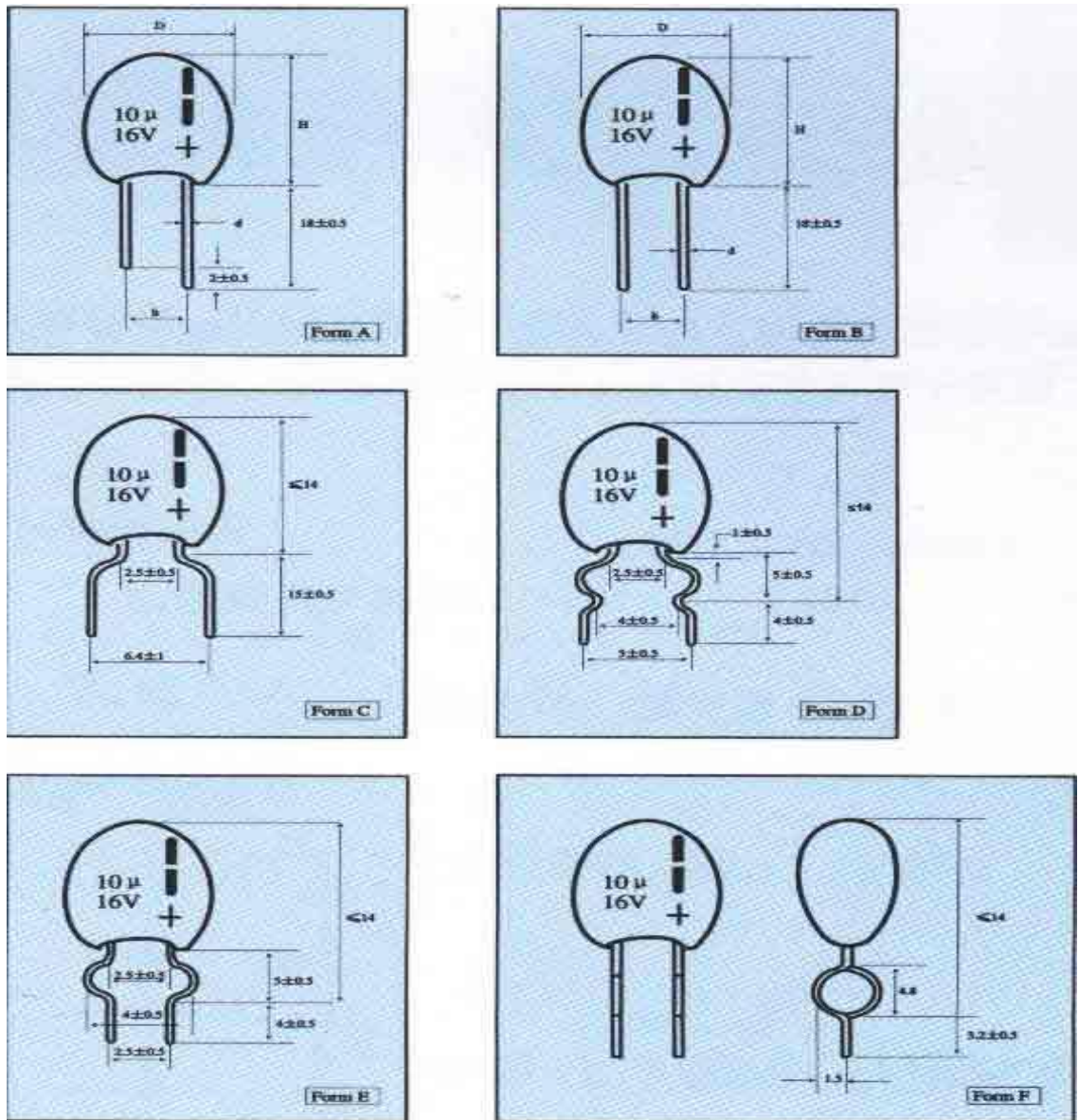
B: 袋装 bag

A: 弹匣式编带 (符合 IEC286-2 标准) Ammo (complied IEC286-2 standard)



符号 Symbol	尺寸 Dimensions(mm)	符号 Symbol	尺寸 Dimensions(mm)
P	12.7±1.0	D	4.0±0.2
P0	12.7±0.3	T	0.5±0.2
W	18(+1,-0.5)	Δh	0±2.0
		H	16±0.5
W0	13	S	2.54±0.5 5.08±0.7
H2	9(+0.75,-0.5)	P1	5.10±0.5 3.85±0.7
W2	0(+1,0)	P2	6.35±0.4
H1	32.5max	ΔP	±1.3max

● 引线形式 Lead Form



产品使用注意事项:

1. 储存 Storage

贮存条件 storage condition

环境温度 environmental temperature: $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$;

相对湿度 relative humidity: 不大于 70% no more than 70%;

贮存期 storing period

自生产入库之日起不超过一年半。No more than one and half year since the date of stocking.

2. 使用注意事项 Application Guide

(1) 波纹电流和波纹电压 Ripple current and voltage

如果在电容器上施加波纹电流，在电容器内会产生焦耳热（功率损耗），因此会影响电容器的可靠性。

If the ripple current is applied to the capacitor, the Joule heat (power dissipated) will be generated in the capacitor, so it will affect the reliability of the capacitor.

1) 功率损耗 Power Dissipated

电容器中实际的功率损耗可以利用下面的公式计算：

The actual power dissipated can be calculated using the following formula:

$$P=I^2 \times ESR \dots \dots \dots \text{公式 1} \quad \text{Formula 1}$$

这里: P: 功率损耗 (瓦特) Power dissipated (Watt)
 Here: I: 波纹电流 (安倍) Ripple current (ampere)
 ESR: 等效串联电阻 (Ω) Equivalent series resistance (ohme)

表1 额定损耗 rated loaded loss

壳号 Case	最大功率损耗(瓦特)Max. power dissipation (Watt) 100KHz 25°C
A	0.075
B	0.085
C	0.110
D	0.150

2) 波纹电流 Ripple current

利用表1中的最大功率损耗, 可以利用下面的公式计算最大波纹电流(Arms):

Using the maximum power dissipation in Table 1, the max. ripple current can be calculated using the following formula:

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

这里: K: 温度降额因子.....表2 Temperature derating factor..... Table 2
 Here: F: 频率降额因子.....表 3 Frequency derating factor..... Table 3.
 ESR: 参考每个具体产品的额定值 Refer to the ratings of each specific product

表2: 温度降额因子K Table 2: temperature drop factor K

温度 temperature	温度降额因子k temperature derating factor K
25°C	1
85°C	0.9
125°C	0.4

表3: 频率降额因子k Table 3: frequency reduction factor F

频率 frequency	10KHz	100 KHz	500KHz	1MHz
降额因子K reduction factor F	0.80	1.00	1.15	1.20

波纹电压E利用公式3计算:

Using formula 3 to calculate corrugated voltage E :

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

这里: E: 波纹电压 Ripple voltage
 Here: Z: 具体频率下的阻抗 Specific frequency impedance

3) 波纹电压 Ripple voltage

施加到电容器上的波纹电压受三个标准的限制:

The ripple voltage applied to the capacitor is limited by three criteria.

(a) 电容器中ESR的功率损耗不超过表1中适当的值。

The power dissipation in the the ESR of capacitor must not exceed the appropriate values in Table1.

(b) 直流电压和波纹电压的峰值之和不超过额定电压。

The positive peak AC voltage plus the DC bias voltage, if any, must not exceed the DC voltage rating of the capacitor.

(c) 直流电压和波纹电压的负峰值之和不超过允许的反向电压。

The negative peak AC voltage, in combination with the bias voltage, if any, must not exceed the permissible reverse voltage ratings presented.

(2) 反向电压 Reverse voltage

由于固体钽电容器是有极性的，不能施加反向电压。如果反向电压不可避免，施加的时间必须要短，并且不能超过下面的值：

Solid tantalum capacitors are polarized devices, and applied reverse voltage can not be allowed. If the reverse voltage is unavoidable, a small degree of transient reverse voltage is permissible for short periods as follow.

25°C.....最大为额定电压的10%或 1V，取小者。

10% of Max. rated voltage or 1V whichever is smaller.

85°C.....最大为额定电压的5%或 0.5V，取小者。

5% of Max. rated voltage or 0.5V whichever is smaller

125°C.....最大为额定电压的1%或 0.1V，取小者。

1% of Max. rated voltage or 0.1V whichever is smaller

即使在上述限制下，电容器也不能连续使用在反向电压模式。

Even under these restrictions, capacitors can not be used continuously in reverse voltage mode.

(3) 使用电压 Working voltage

1) 对于一般应用，使用电容器额定电压的50% 或更小。

For general applications, using 50% of rated voltage of capacitors or less.

2) 当电容器用在电源线或低阻抗电路中时，使用电压应在额定电压的30%内(最大为50%)，以避免浪涌电流的不利影响。

When used at the power circuit, low impedance circuit, coupling circuit or switching circuit which has leakage current problems, please design the circuit with voltage under 30% of the working voltage (max 50%) to avoid the adverse effect of the surge current.

3) 温度在85°C或以上时要降额使用

Derating voltage when temperature above 85°C.

当片式钽电容器用在 85°C或以上温度时，从下面的表达式中计算减少的电压 U_T ，但是，注意周围温度不超过 125°C。

When the chip tantalum capacitor is used at 85 or more temperatures, the reduced voltage (U_T) is calculated from the following expression, however, note that the ambient temperature is not more than 125.

$$U_T = V_0(U_R - U_C)(T - 85)/40$$

这里：

UR: 额定电压(V)

UC: 125°C时的降额电压

T: 周围环境温度 (°C)

Here:

UR: Rated voltage (V)

UC: Derating voltage at 125°C

T: Ambient temperature(°C)

(4) 保护电阻 Protective resistance

在有瞬间电流（开关电路、充电/放电电路等）通过的电路中，与电容器串联的电阻至少为 $3\Omega/V$ ，这样可以提高钽电容器的可靠性。如果电容器处于低阻抗电路中，施加到电容器上的电压应该是额定电压的 $1/2 \sim 1/3$ 。

In a circuit (switching circuit, charge / discharge circuit, etc.) that has an instantaneous current, series resistance is at least $3 \Omega / V$, this can improve the reliability of tantalum capacitors. If the capacitor is in a low impedance circuit, the voltage applied to the capacitor should be half or one third of the rated voltage.

(5) 冗余设计 Redundancy

二氧化锰钽电容器在短路时会发热、并可能产生火和燃烧。这决定于超流情况、时间和其它因素。

当设计电路时，提供尽可能多的余地，以保持钽电容器的可靠性。

MnO₂ tantalum capacitors will heat, and may cause fire and burn in the short circuit. This is determined by the situation, time and other factors. When the circuit is designed, it is possible to provide the best possible space to keep the tantalum capacitor reliability.

(6) 焊接 Soldering

片式钽电容器适用回流焊，不适合波峰焊和手工焊接。回流焊温度 $\leq 260^\circ\text{C}$ ，时间小于 5 秒。如一定要采用手工焊接，则电烙铁的功率 $\leq 25\text{W}$ ，温度 $< 300^\circ\text{C}$ ，焊接时间 < 3 秒，不能用烙铁头直接接触产品引线，更不能接触产品本体，要用熔化的焊锡接触引线焊接。

The chip tantalum capacitor can be used for reflow soldering, which is not suitable for wave soldering and manual welding. The reflow temperature are less than 260°C , less than 5 seconds. If you must use manual welding, should use the melted solder to contact lead, and the electric soldering iron power should be less than or equal to 25W, temperature should be less than 300°C , welding time should be less than 3 seconds, can not use electric iron contact the product lead directly, and in particular, can not contact the product ontology directly.

3. 实测数据表 Report

编号	型号规格/壳号	C (μF)				tg δ (%)				I (μA)				结论	备注
	测试条件	25 $^\circ\text{C}$ /100HZ/ 1V													
1	CA42-16V226	15.2	15.5	15.61	15.83	1.7	1.81	1.98	2.08	0.23	0.26	0.34	0.39	合格	60s 读数
		15.93				2.15				0.45					
检验：颜娜		确认：刘虎													