



CA45片式钽电容器

CA45Tantalum Chip Capacitors

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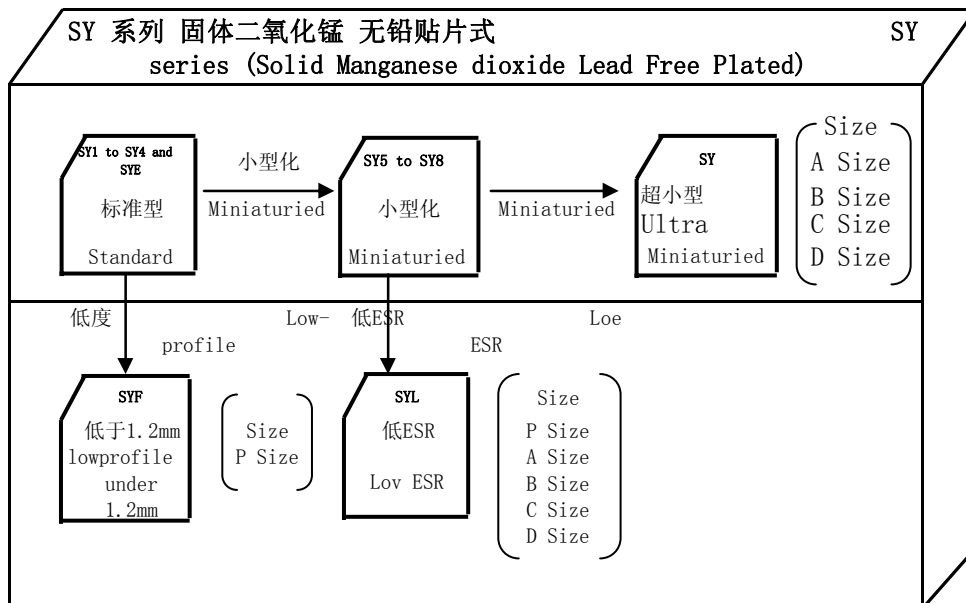
Tantalum Chip Capacitors

CA45钽芯片电容器（片式）TANTALUM CHIP CAPACITORS(CHIPCON)

■型号清单 (Type list for tantalum Electrolytic capacitors)

系列名称 Series name	SY 固体二氧化锰无铅贴片 (solid Manganese dioxide lead-Free Plated)		
过程方式 Processed style	树脂型 片式 Resin molded chip type		
型号名称 Type designation	SYF	SY1 to SY9, SYE	SYL
芯片 photograph			
外观 Features	低高度: 1.2mm LowprofileHight:1.2mm	标准, 小型, 超小型 Standard, Miniaturied & Ultra Miniaturied	低阻抗 Low ESR
标准应用 Applicable standard	JISC5101-3:1998 (IEC60384-3:1989)		
温度范围 Category temperature range(°C)	-55 to +125°C (Above 85°C use category voltage)		
额定电压 Rated voltage (VDC)	2.5 to 25	2.5 to 50	4 to 16
额定容量 Rated capacitance(μF)	0.1 to 47	0.1 to 470	1 to 330
额定容量偏差 Rated capacitance tolerance (%)	±10%, ±20%		
漏电流 Leakage current (μA)	0.01CV (5 min)		

■引元分类 (Systematized classification)



Note .

- Design, Specification are subject to change without notice.
- Ask factory for technical specifications before purchase and /or use.



CA45片式钽电容器的使用注意事项（也指技术说明）

■Caution for using tantalum chip capacitor. (Refer also to the TECHNICAL NOTE)

使用LELON产品前请仔细阅读产品说明书

Please read product specifications before using LELON products

■ 电路设计

1. 确认额定值表示

确认工作和确认安装环境，并在设置的额定的范围内使用。

因为有故障率的要求，根据你的故障率设计你的电路。降低工作电压，工作温度或通过插入一个电阻限制浪涌电源等，可降低故障率。

2. 在额定电压内使用设定

额定电压定义为最大峰值电压（直流电和交流电峰值的总和），电容可允许的最高工作温度。

使用电压为额定电压的设置。温度超过85℃时，使用电压为不超过降额电压。

建议工作温度为额定值，这样尽可能保证可靠性。

设置在低阻抗电路使用时，建议电压不大于额定电压的1/3。

3. 使用类别温度范围内温度设定范围。

在温度超过85℃时，设定电压不能更多超过降额电压。低温使用有利于可靠性。如果电容器被应用在电路中会自身发热或别的原因，用这种方法考虑温度上升。

4. 注意瞬间电流过大。

自从在低阻抗电路中使用以来，像电源电路，可能故障率会提高。请注意以下事项：

(1)如果是电源供应方面使用电容，在低电压应用时，瞬间的电流将可能导致短路或增加漏电流。因而，接上一个3Ω/V或更高的电阻。

(2)建议一个充分降级的使用电压（三分之一的额定电压或更低）可以控制冲击电流，降低故障率。

■Circuit design

1. Confirm rated performances.

Confirm the working and installation environments of the set, and use the set within the range of specified rated performances.

Since a failure rate has been provided, set your circuit according to the failure rate. The failure rate can be reduced by decreasing the working voltage, working temperature, or limiting rush current by inserting a resistance, and the like.

2. Use the set within rated voltage.

Rated voltage is defined as a maximum peak voltage (the sum of DCV and peak ACV) that can be applied to a capacitor at a maximum working temperature.

Use the set at voltages within the rated voltage. At temperatures more than 85℃, use the set at voltages not more than the derated voltage.

It is recommended to derate working temperature as far as reliability allows.

When the set is used in a low impedance circuit, voltage should not be more than or one third of the recommended rated voltage.

3. Use the set at temperatures within the category temperature range.

At temperatures more than 85℃, apply a voltage not more than the derated voltage. Low temperature usage is advantageous for reliability. If capacitors make self-heat generation by application of ripples or other reasons, take such a temperature rise into consideration.

4. Pay attention to an excessive momentary current.

Since the set's usage in a low-impedance circuit, such as a power circuit, is likely to raise the failure rate. Please be careful about the following matters:

(1) If the power supply side impedance looking from the capacitor side is low when voltage is applied, a momentary current will likely cause a short circuit or an increased leakage current. Therefore, insert a resistance of 3Ω/V or higher.

(2) The use of a fully derated voltage (one third of the rated voltage or lower) is recommended to control rush current and to lower the failure rate.

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5. 注意纹波电源

在片式钽电容中纹波能力取决于热损失电容元素和热辐射的情况系数。

当超过允许值，电容器的自热因素增加造成麻烦，这必须给予高度关注。

直流电压和纹波电压的降值总和不得超过额定值。设定直流电压使峰值不会超过一个反向电压。

6. 不适用反向电压

由于片式钽电容器具有极性，不适用反向电压那部分。使用逆行反向电压可能会导致不正常的电流损坏电容器。

当应用纹波电压时，控制不超过允许值。

7. 注意频率特性。

片式钽电容的电容和损耗角正切的测量，通常120Hz。

增加频率引起电容各损耗角正切的下降，设计必须加以重视。

片式钽电容器薄膜和陶瓷电容器特性不同。

使用钽电容器替代一定要小心。

5. Pay attention to ripple current.

The ripple capability of the tantalum chip capacitor is determined by heat loss of the capacitor element and the heat radiation coefficient of its package case.

When the allowable value is exceeded, the self-heat-generation of the capacitor increases to cause trouble. This must be given much attention.

The sum of the peak DCV value and ripple voltage must not exceed the rated value. Set the DCV so that the peak value does not become a reverse voltage.

6. Do not apply a reverse voltage.

Since the tantalum chip capacitor has polarity, do not apply a reverse voltage to the part. Applying voltage with reversed polarity could cause an abnormal current to damage the capacitor.

When ripple voltage is applied, control it not to exceed the allowable value.

7. Pay attention to frequency characteristics.

Capacitance and tangent of loss angle of tantalum chip capacitors are usually measured at 120Hz.

Increased frequency decreases capacitance and raises tangent of loss angle, which must be given attention in designing.

Tantalum chip capacitors are different from film and ceramic capacitors in characteristics.

Be careful when a tantalum capacitor is used as an alternative.

■安装

1. 在安装使用前确认电容的额定电压和极性。
2. 由于安装空间和其他材料的原因，不可断开电容器。
3. 不要给电容器施加重力。
4. 不要使用落在地上一次的电容器
5. 已安装一次的电容器不要拆掉重新安装。
6. 电容器安装用万用表仔细检测。
避免使用过压或反向电压到电容器上。

■Mounting

1. In mounting, confirm the rated voltage, capacitance, and polarity before usage.
2. Don't cut off the materials of the capacitor due to the mounting space and other reasons.
3. Don't apply an excessive force to the capacitor.
4. Do not use the capacitor that has fallen once on the floor.
5. Do not remove and reuse the capacitor that has been mounted once.
6. Connect the capacitors to a tester or multimeter carefully. Avoid applying overvoltage or reverse voltage to the capacitors.

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■焊接

1. 焊接一定要遵守规定条件要求进行焊接。

在最短的时间内完成焊接在可靠性方面是非常重要的。

以下的条件将使用焊接接头完美。

2. 焊接产品后立即清洗，其余残渣酸、碱不要留下。

3. 尽可能避免使用超声波清洗。

如果使用超声波清洗是不可避免的，使用一个严格的系统来检查任何异常情况。

4. 纯锡(Sn 100%)的熔点是232℃

如果在232℃ 或低于232℃ 的温度焊接，确认存在异常和不足。

(对于回流焊的方法，焊接峰值温度建议使用245℃~255℃)。

■紧急情况

1. 已设定使用的电容器不要直接接触，它可能会导致触电。

在电容内部，没有办法解决酸，碱，导电问题有解决方案可能会导致电路之间或者电容器短路。

2. 如果使用中有一种奇怪的气味和烟雾产生，立即关闭设置的主电源。

3. 如果一个电容器燃烧，从树脂燃烧和分解产生气体，因此，不要接近电容器。

■贮存

1. 在室温下（不超过40℃），相对湿度不超过70%保持产品清洁

高温和高湿使可焊性显著变差。

在包装的条件下贮存电容器。

2. 存放的地区避免存在振动。

■Soldering

1. Be sure to observe the soldering conditions stipulated in our catalogs and specifications.

It is very important in terms of reliability that soldering is completed in the shortest possible time and under conditions where the joints will be soldered perfectly.

2. Wash products immediately after the soldering process so that the dregs of flux and the remaining acid and alkali will not be left.

3. Avoid the use of ultrasonic cleaning whenever possible.

If the use of ultrasonic cleaning is unavoidable, make a trial of the system in conditions severer than those in actual cleaning to check for any abnormality.

4. Melting point of terminal plating(Sn 100%) is 232℃

If the soldering of lead free at 232℃ or less, confirm the presence of abnormality enough.

(For the reflow method, soldering from the peak temperature 235℃ to 250℃ is recommended.)

■In a emergency

1. Do not touch a capacitor directly when then set is being used, it could cause an electric shock.

Never place conductive solutions, such as acid and alkali, on the capacitor. Those solutions could cause a short circuit between circuits or in the capacitor.

2. If a strange smell or smoke is generated from a set in use, turn off the main power supply for the set immediately.

3. If a capacitor burns, combustion and decomposition gases are generated from the wold resin and the like. Therefore, do not get close to the capacitor.

■Storage

1. Keep the products clean at room temperatures (not more than 40℃) and relative humidities (not more than 70%).

Leaving them at high temperatures and humidities reduces their solderability significantly. Storage in packaged condition is recommended.

2. Avoid storage in an area where vibration exists.

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3. 一般长时间的存放，包装材料会恶化

注意编带，特别是材料，因为他们容易变坏。

建议使用一年内的电容器。

■交通运输

不安装洒在地板上或桌子上的产品。

因为这此产品芯子使用是钽粉，因此的电容器过渡振动或冲击可能会引起可靠性降低。

■处置

如果任何电容器需要处理，应作为工业废弃物处理。

■别的注意事项

1. 除上述事项，一定要确认以下内容：

日本电子和信息技术产业协会技术报告。

EIAJ RCR-2368B规定“与电子设备用固体电解质相关钽电解电容器的准则”

2. 请给与理解，我们的目录的内容受改善的更改，恕不另行通知。

在我们目录中提到的数据代表值不保证展示。

3. Storage for a long period of time deteriorates packaging materials.

Pay attention to taping materials in particular, since they deteriorate easily.

It is recommended to use the capacitor within one year.

■Transportation

Do not drop the products on the floor or on a table, since these products use solidified tantalum powder, handle the capacitors carefully because excessive vibration or shock will likely cause reliability reduction.

■Disposal

If any capacitors need to be disposed, treat as industrial waste.

■Other notes

1. In addition to the above-mentioned matters, be sure to confirm the contents of the following document; Technical report of Japan Electronics and Information Technology industries Association, EIAJ RCR-2368B, the "Guideline of notabilia for fixed tantalum electrolytic capacitors with solid electrolyte for use in electronic equipment"

2. Please understand beforehand that the contents of our catalogs are subject to alteration for improvement without prior notice.

Data mentioned in our catalog are representative values that do not assure performances.

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TAN. No1 2010/2012E

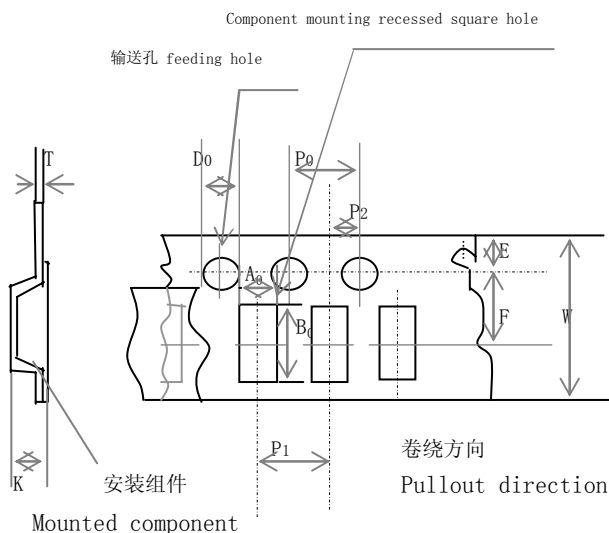
Tantalum Chip Capacitors



■ 载带尺寸: (Emboss carrier tape dimension)

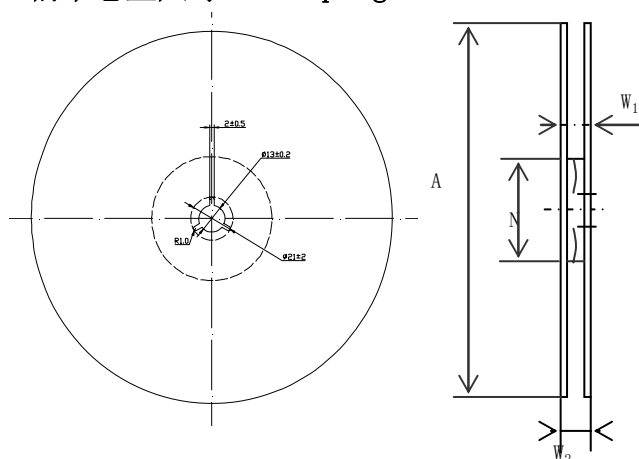
组件安装方凹孔

Unit:mm



Size code	A0±0.2	B0±0.2	K±0.2	W±0.3 tape width	F±0.1	P1±0.1 pitch of component	E±0.1	P2±0.1	P1±0.1 Feed hole pitch	D0+0.1 -0 Feed hole diameter	T
P	1.4	2.2	1.2	8	3.5	4	1.75	2	4	1.5	0.2 ~0.3
A	1.9	3.5	1.9								
B	3.1	3.8	2.1	5.5	8	1.75	2	4	1.5	0.2 ~0.3	
C	3.7	6.4	2.9								
D	4.8	7.7	3.2	12	5.7	8	1.75	2	4	1.5	0.2 ~0.3
E	4.6	7.6	4	12	5.5	8					

■ 编带卷盘尺寸: (Taping reel dimension)



Size code	ape width	A±2.0	N (Min.)	W ₂ ±1.0	W ₁ ±0.3
P, A, B	8	180	60	11.4	9
C, D, E	12	180	60	15.4	13

回收卷盘可能用于资源保护。

*Recycling Reels might be used the resource conservation.

■ 封装胶带剥离强度 (Sealing tape reel strength)

剥离角度: 用165 to 180° 角剥离表面粘接力,

Peel angle: 165 to 180° referred to the surface

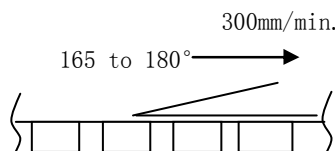
on which the tape is glued.

剥离速度: 每分钟300mm.

Peel speed: 300mm per minute.

在这些条件下, 剥离强度必须在0.1~0.7N以下

The peel strength must be 0.1 to 0.7N under these conditions



■ 包装数量: (Packaging quantity)

Size code	Quantity/Reel
P	3,000pcs.
A, B	2,000pcs.
C, D, E	500pcs.

■ 每盘装载量 (Component insertion on reel)

必须要求每盘标准支数空带数不超过0.1%

It is required that the number of empty places in the tape per reel shall not exceed 0.1% without consecutive empty plaecs.

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■ 包装方法 (Packing method)

. 极性: 阳极与圆孔对面 (只有孔对应极性一致), 上标记上方向临盖带, 引脚对着载带底部。

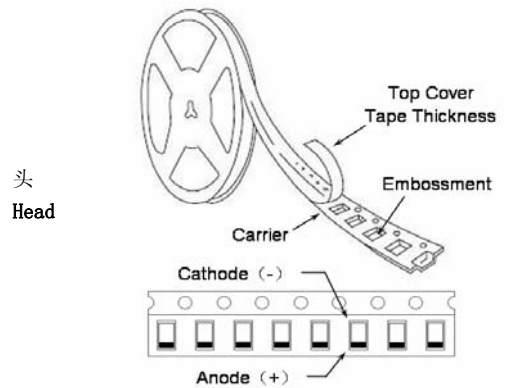
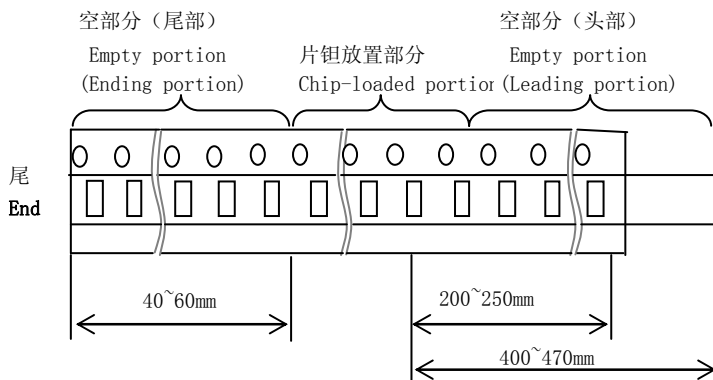
. Polarity: Anode on the opposite side of the feed hole. (for the polarity code R only.) The bottom of lead is toward the emboss pocket. upper marking side is faced to the top cover tape.

. 空载带不得少于400mm, 其中包括200mm 没有载带延长盖带部分。

. The leader length of the tape shall not be less than 400mm including 200mm or more embossed sections in which no parts are contained.

. 每盘核心部要求有一段40~60mm 的空载带部分。

. The winding core is provided with an over 40mm long empty section.



■. 卷盘上的标签标识 Label mark on reel

条形码 bar code style:

- 商标 trade mark
- 型号 type: CA45
- 规格及壳号 size
- 产品代码 product identification
- 生产批号 lot number
- 数量 quantity per reel
- 生产日期 manuf. Date
- ROHS 标识 ROHS mark

■. 示例 For example:

TYPE: CA45 SIZE: D
VOLT: 16V CAP: 100 μF
DATE: 10C11 LOT: GCD068



<QTY> 500 PCS

SY5-1C107M-RD

<ROHS>



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MADE IN CHINA

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外型尺寸: (Outside dimensions)

ELA code	Size code	L±0.2	W±0.2	H±0.2	W2±0.2	a±0.3
2012	P	2	1.25	1.2(max)	0.9	0.5
3216	A	3.2	1.6	1.6	1.2	0.8
3528	B	3.4	2.8	1.9	2.2	0.8
6032	C	6	3.2	2.5	2.2	1.3
7343	D	7.3	4.3	2.8	2.4	1.3
7343	E	7.3	4.3	4	2.4	1.3

打印标志: (Printed markings)

SYF, SY, SYL Series

Ex. 6.3v10μF Ex. 35v0.47μF Ex. 16v3.3μF

额定电压 (Rated voltage) (V)	2.5	4	6.3	10	16	20	25	35	50
额定电压代号 (Rated voltage code)	e	G	J	A	C	D	E	V	H

额定电压 (Rated voltage) 2.5V 打印标志为 (is marked) "2V"
 额定电压 (Rated voltage) 6.3V 打印标志为 (is marked) "6V"

容量标志清单 (list of capacitance marking)

(P.A size)

系列名称 Sdries name	额定容量代号 Rated capacitance code	
	P size	A size
0.1	A	104
0.15	E	154
0.22	J	224
0.33	N	334
0.47	S	474
0.68	W	684
1	A	105
1.5	E	155
2.2	J	225
3.3	N	335
4.7	S	475
6.8	W	685

系列名称 Sdries name	额定容量代号 Rated capacitance code	
	P size	A size
10	A	106
15	E	156
22	J	226
33	-	336
47	-	476
68	-	686
100	-	107

记号标记系统 (Part No. system)

Example: Type SY6:16v.10uf:A size

型号 Type code: SY6 1C 106 M [] [] - R A []

额定电压: (Rated voltage code)

Rated voltage (v)	0E	0G	0J	1A	1C	1D	1E	1V
Rated voltage code	2.5	4	6.3	10	16	20	25	35

容量 偏差: (Capacitance tolerance)

Rated capacitance	Rated capacitance code
47*104pF=0.47uF	474
10*105pF=1.0uF	105
22*106pF=2.2uF	225

增加标志: (Additional code) 没有纳入的标准 (Not entered for a standard type)

容量 偏差: (Capacitance tolerance)

Rated capacitance code	Rated capacitance tolerance
K	±10%
M	±20%

编带极性: Taping polarity code (R only)

Polarity	Taping polarity code
(Diagram showing polarity marking)	R

拉出方向 Pullout direction

阳极标志 Anode marking

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CA45树脂塑封片式电容器 (Resin mold chip type capacitors) 标准型 (Standard Type) 规格 (Specifications)

项目 (Item)	Performance		
温度范围 Category temperature range (°C)	- 55 to +125 (超过85°C使用电压范围) (Above 85°C use category voltage)		
漏电流 Leakage current (µA)	参照标准 Refer to standard ratings table		
额定电容偏差 Tolerance at rated capacitance (%)	±10%, ±20% (120HZ)		
损耗角正切 Tangent of loss angle	参照标准 Refer to standard ratings table (120HZ)		
等效串联电阻 ESR	参照标准 Refer to standard ratings table (100kHz)		
耐热性焊接 Resistance to soldering heat	测试条件在260°C浸泡5秒 Test conditions: Soaking at 260°C for 5 seconds		
		SYF, SYL~SY9, SYL	
	漏电流 Leakage current	初始规定值或更小 The initial specified value or less	
	容量偏差范围 Percentage of capacitance change	初始值±10% Within ±10% of initial value	
高低温特性 Characteristics at high and low temperature	- 55°C	容量偏差范围 Percentage of capacitance change	初始值±10% Within - 10 to 0% of the initial value
		损耗角正切 Tangent of loss angle	参照标准 Refer to standard rating table
	85°C	漏电流 Leakage current	规定初始值1000%或以下 1000% or less of the initial specified value
		容量偏差范围 Percentage of capacitance change	初始值0~10% Within 0 to 10% of the initial value
		损耗角正切 Tangent of loss angle	参照标准 Refer to standard rating table
	125°C	在降额电压测量漏电数据 Leakage current data have been measured at derated voltage*	
		漏电流 Leakage current	规定初始值1250%或以下 1250% or less of the initial specified value
		容量偏差范围 Percentage of capacitance change	初始值0~12% Within 0 to 12% of the initial value
	稳态湿热 (湿度) Damp heat, steady state (Humidity)	检测条件: 在温度40°C, 相对湿度90~95%下贮存500小时 Test conditions: Left at 40°C under 90 to 95% RH for 500 hours	
漏电流 Leakage current		初始规定值或更小 The initial specified value or less	
容量偏差范围 Percentage of capacitance change		初始值±10% Within ±10% of initial value	
耐久性 (负载寿命) Endurance (Load life)	检测条件: 在额定电压85°C应用2000小时 Test conditions: Rated voltage applied at 85°C for 2000 hours;		
	漏电流 Leakage current	初始规定值或更小 The initial specified value or less	
	容量偏差范围 Percentage of capacitance change	初始值±10% Within ±10% of initial value	
失效率 Failure rate	小于1%/1000小时 (参考技术说明) Less than 1%/1000 hour (Refer to TECHNICAL NOTE)		
其它 Others	符合IEC 60384-3: 1989 (JIS C5101-3: 1998) Conforms to IEC 60384-3:1989 (JIS C5101-3:1998)		

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Tantalum Chip Capacitors



CA45树脂塑封片式电容器 (Resin mold chip type capacitors) 标准型 (Standard Type)
规格 (Specifications)

额定电压与125℃降额电压的关系 (Relation between the rated and the 125℃ category voltage) .

额定电压 Rated voltage (V)	2.5	4	6.3	10	16	20	25	35	50
125℃降额电压 125℃category voltage (V)	1.6	2.5	4	6.3	10	13	16	22	33

尺寸表 (Dimension table)

额定容量 Rated capacitance(μF)	额定容量代码 Rated capacitance code	2.5V e	4V G	6.3V J	10V A	16V C	20V D	25V E	35V V	50V H
0.1	104								A	
0.15	154								A	
0.22	224								A	A
0.33	334					P			A	A
0.47	474					P		A	A B	A
0.68	684				P	P	A	A	A B	A B
1	105				P	P A	A	A	A B	B
1.5	155			P	P A	P A	A	A B	A B C	B
2.2	225			P A	P A	P A	A B	A B	B C	B
3.3	335		P A	P A	P A	A B	A B	B	B C	C
4.7	475		P A	P A	P A B	A B	A B	B C	C D	C
6.8	685		P A	P A B	P A B	A B	A B C	B C	C D	D E
10	106		P A B	P A B	P A B	A B C	B C	C D	C D	D E
15	156	A	P A B	P A B	A B C	B C	C D	C D	D E	
22	226	A	P A B	A B C	A B C	B C D	C D	D	D E	
33	336	P A	A B C	A B C	B C D	C D	D	D E		
47	476	A	A B C	A B C D	B C D	C D	D E	D E		
68	686	A B	A B C D	B C D	C D	D	D E	E		
100	107	A B	B C D	B C D	C D	D E	E			
150	157	A B	B C D	C D E	D E	D E	E			
220	227	A B	B C D	D E	D E					
330	337		D E	D E	D E					
470	477		D E	D E						

标称 容量 C _R (μF)	电容量变化范围 (%)			最大值						
				损耗角正切值 (%)				漏电流 (μA)		
	-55℃	85℃	125℃	-55℃	25℃	85℃	125℃	25℃	85℃	125℃
≤1.0	-10	10	+12/	6	4	6	6	I ₀ ≤0.01 C _R U _R 或0.5 μA取最大值	10I ₀	12.5 I ₀
1.5~68			10	6	10	10				
≥100			12	8	12	12				

注: 1) > +85℃施加类别电压使用。2) 125℃时缩小型容量的变化率+15~20%。

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Tantalum Chip Capacitors

CA45树脂塑封片式电容器 (Resin mold chip type capacitors) 标准型 (Standard Type)

标准等级 (Standard ratings)

额定电压 Rated voltage (V)	额定容量 Rated capacitance (μF) (120Hz)	标志 Marking	外观尺寸 EIA size code	尺寸代码 ELAN size code	漏电流 Leakage current (μA, or less)	损失角变化范围 Tangent of the loss angle (less) (120Hz)				E. S. R (Ω) (100KHz)	系列号 ELNA Part No.	包装数量 Taping minimum packing pcs. (pcs/reel)	备注 Note
						- 55℃	25℃	85℃	125℃				
2.5	15	e156	3216	A	0.5	0.09	0.06	0.08	0.09	4	SY1-0E156M-RA	2,000	*
	22	e226	3216	A	0.55	0.12	0.08	0.1	0.12	2.8	SY4-0E226M-RA	2,000	*
	33	eN	2012	P	0.82	0.12	0.08	0.1	0.12	4	SYF-0E336M-RP	3,000	
	33	e336	3216	A	0.82	0.18	0.08	0.1	0.12	2.5	SY5-0E336M-RA	2,000	
	47	e476	3216	A	1.17	0.18	0.12	0.16	0.18	2.5	SY6-0E476M-RA	2,000	
	68	e686	3216	A	1.7	0.27	0.18	0.23	0.27	2	SY7-0E686M-RA	2,000	
	68	---	3528	B	1.7	0.12	0.08	0.1	0.12	1.5	SY5-0E686M-RB	2,000	*
	100	e107	3216	A	2.5	0.27	0.18	0.23	0.27	2	SY8-0E107M-RA	2,000	
	100	---	3528	B	2.5	0.12	0.08	0.1	0.12	1	SY6-0E107M-RB	2,000	
	150	---	3528	B	3.75	0.18	0.12	0.16	0.18	1	SY7-0E686M-RA	2,000	
220	---	3528	B	5.5	0.27	0.18	0.23	0.27	1	SY8-0E227M-RB	2,000		
4	3.3	GN	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-0G335M-RP	3,000	*
	3.3	G335	3216	A	0.5	0.09	0.06	0.07	0.09	8	SY1-0G335M-RA	2,000	*
	4.7	GS	2012	P	0.5	0.12	0.08	0.12	0.12	5.5	SYF-0G475M-RP	3,000	*
	4.7	G475	3216	A	0.5	0.12	0.08	0.1	0.12	4	SY2-0G475M-RA	2,000	
	6.8	GW	2012	P	0.5	0.12	0.08	0.1	0.12	5.5	SYF-0G685M-RP	3,000	*
	6.8	G685	3216	A	0.5	0.12	0.08	0.1	0.12	4	SY2-0G685M-RA	2,000	
	10	GA	2012	P	0.5	0.15	0.1	0.12	0.15	5.5	SYF-0G106M-RP	3,000	
	10	G106	3216	A	0.5	0.12	0.08	0.1	0.12	4	SY3-0G106M-RA	2,000	
	10	---	3528	B	0.5	0.09	0.06	0.07	0.09	2.5	SY1-0G106M-RB	2,000	*
	15	GE	2012	P	0.6	0.15	0.1	0.12	0.15	4.5	SYF-0G156M-RP	3,000	
	15	G156	3216	A	0.6	0.12	0.08	0.1	0.12	3	SY4-0G156M-RA	2,000	
	15	---	3528	B	0.6	0.12	0.08	0.1	0.12	3.5	SY2-0G156M-RB	2,000	*
	22	GJ	2012	P	0.88	0.15	0.1	0.12	0.15	4.5	SYF-0G226M-RP	3,000	
	22	G226	3216	A	88	0.12	0.08	0.1	0.12	2.5	SY5-0G226M-RA	2,000	
	22	---	3528	B	0.88	0.09	0.06	0.08	0.09	1.5	SY3-0G226M-RB	2,000	
	33	G336	3216	A	1.32	0.15	0.1	0.12	0.15	2.5	SY6-0G336M-RA	2,000	
	33	---	3528	B	1.32	0.12	0.08	0.1	0.12	1.5	SY4-0G336M-RB	2,000	
	33	---	6032	C	1.32	0.09	0.06	0.07	0.09	2.2	SY1-0G336M-RC	500	*
	47	G476	3216	A	1.88	0.15	0.1	0.13	0.15	2.5	SY7-0G476M-RA	2,000	
	47	---	3528	B	1.88	0.12	0.08	0.1	0.12	1.5	SY5-0G476M-RB	2,000	
	47	---	6032	C	1.88	0.12	0.06	0.08	0.12	1	SY2-0G476M-RC	500	
	68	G686	3216	A	2.72	0.24	0.16	0.19	0.24	2.5	SY8-0G686M-RA	2,000	
	68	---	3528	B	2.72	0.12	0.08	0.1	0.12	1.5	SY6-0G686M-RB	2,000	
	68	---	6032	C	2.72	0.09	0.06	0.08	0.09	1	SY3-0G686M-RC	500	
	68	---	7343	D	2.72	0.09	0.06	0.07	0.09	0.7	SY1-0G686M-RD	500	
	100	---	3528	B	4	0.15	0.1	0.13	0.15	1	SY7-0G107M-RB	2,000	
	100	---	6032	C	4	0.12	0.08	0.1	0.12	0.8	SY4-0G107M-RC	500	
	100	---	7343	D	4	0.12	0.08	0.1	0.12	0.8	SY2-0G107M-RD	500	*
	150	---	3528	B	6	0.24	0.16	0.19	0.24	1	SY8-0G157M-RB	2,000	
	150	---	6032	C	6	0.15	0.1	0.13	0.15	0.8	SY5-0G157M-RC	500	
	150	---	7343	D	6	0.12	0.08	0.1	0.12	0.8	SY3-0G157M-RD	500	
	220	---	3528	B	8.8	0.27	0.18	0.23	0.27	1	SY9-0G227M-RB	2,000	
	220	---	6032	C	8.8	0.18	0.12	0.15	0.18	0.7	SY6-0G227M-RC	500	
	220	---	7343	D	8.8	0.12	0.08	0.1	0.12	1	SY4-0G227M-RD	500	
330	---	7343	D	13.2	0.21	0.14	0.18	0.21	0.7	SY5-0G337M-RD	500		
330	---	7343	E	13.2	0.21	0.14	0.18	0.21	0.9	SYE-0G337M-RE	500		
470	---	7343	D	18.8	0.24	0.16	0.21	0.24	0.3	SY6-0G477M-RD	500		
470	---	7343	E	18.8	0.24	0.16	0.21	0.24	0.5	SYE-0G477M-RE	500		

说明中连续星号表示由于小型化制造减少班次等。

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新的设计建议选择具有较高电压和相同容量较小的产量。

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Note .

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Tantalum Chip Capacitors



CA45树脂塑封片式电容器 (Resin mold chip type capacitors) 标准型 (Standard Type)

标准等级 (Standard ratings)

额定电压 Rated voltage (V)	额定容量 Rated capacitance (μF) (120Hz)	标志 Marking	外观尺寸 EIA size code	尺寸代码 ELAN size code	漏电流 Leakage current (μA, or less)	损失角变化范围 Tangent of the loss angle (less) (120Hz)				E.S.R (Ω) (100KHz)	系列号 ELNA Part No.	包装数量 Taping minimum packing pcs. (pcs/reel)	备注 Note
						- 55℃	25℃	85℃	125℃				
6.3	1.5	JE	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-0J155M-RP	3,000	
	2.2	JJ	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-0J225M-RP	3,000	
	2.2	J225	3216	A	0.5	0.09	0.06	0.07	0.09	8	SY1-0J225M-RA	2,000	*
	3.3	JN	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-0J335M-RP	3,000	
	3.3	J335	3216	A	0.5	0.09	0.06	0.08	0.09	7	SY2-0J335M-RA	2,000	
	4.7	JS	2012	P	0.5	0.12	0.08	0.1	0.12	6	SYF-0J475M-RP	3,000	
	4.7	J475	3216	A	0.5	0.09	0.06	0.1	0.09	4	SY2-0J475M-RA	2,000	
	6.8	JW	2012	P	0.5	0.12	0.08	0.1	0.12	6	SYF-0J685M-RP	3,000	
	6.8	J685	3216	A	0.5	0.09	0.06	0.08	0.09	3.5	SY3-0J685M-RA	2,000	
	6.8	---	3528	B	0.5	0.09	0.06	0.07	0.09	3	SY1-0J685M-RB	2,000	*
	10	JA	2012	P	0.63	0.15	0.1	0.12	0.15	6	SYF-0J106M-RP	3,000	
	10	J106	3216	A	0.63	0.12	0.08	0.1	0.12	3	SY4-0J106M-RA	2,000	
	10	---	3528	B	0.63	0.09	0.06	0.08	0.09	3	SY2-0J106M-RB	2,000	
	15	JE	2012	P	0.94	0.24	0.16	0.19	0.24	5	SYF-0J156M-RP	3,000	
	15	J156	3216	A	0.94	0.12	0.08	0.1	0.12	3	SY5-0J156M-RA	2,000	
	15	---	3528	B	0.94	0.09	0.06	0.08	0.09	2	SY3-0J156M-RB	2,000	
	22	J226	3216	A	1.38	0.15	0.1	0.13	0.15	2.5	SY6-0J226M-RA	2,000	
	22	---	3528	B	1.38	0.12	0.08	0.1	0.12	1.5	SY4-0J226M-RB	2,000	
	22	---	6032	C	1.38	0.09	0.06	0.07	0.09	1	SY1-0J226M-RC	500	*
	33	J336	3216	A	2.07	0.15	0.1	0.13	0.15	2.5	SY7-0J336M-RA	2,000	
	33	---	3528	B	2.07	0.12	0.08	0.1	0.12	1.5	SY5-0J336M-RB	2,000	
	33	---	6032	C	2.07	0.09	0.06	0.08	0.09	1	SY2-0J336M-RC	500	
	47	J476	3216	A	2.96	0.24	0.16	0.19	0.24	2.5	SY8-0J476M-RA	2,000	
	47	---	3528	B	2.96	0.15	0.1	0.13	0.15	1	SY6-0J476M-RB	2,000	
	47	---	6032	C	2.96	0.09	0.06	0.08	0.09	1	SY3-0J476M-RC	500	
	47	---	7343	D	2.96	0.09	0.06	0.07	0.09	0.7	SY1-0J476M-RD	500	*
	68	---	3528	B	4.28	0.15	0.1	0.13	0.15	1	SY7-0J686M-RB	2,000	
	68	---	6032	C	4.28	0.12	0.08	0.1	0.12	0.8	SY4-0J686M-RC	500	
	68	---	7343	D	4.28	0.09	0.06	0.08	0.09	0.8	SY2-0J686M-RD	500	*
	100	---	3528	B	6.3	0.18	0.12	0.15	0.18	1	SY8-0J107M-RB	2,000	
100	---	6032	C	6.3	0.15	0.1	0.13	0.15	0.7	SY5-0J107M-RC	500		
100	---	7343	D	6.3	0.12	0.08	0.1	0.12	0.8	SY3-0J107M-RD	500		
150	---	6032	C	9.45	0.18	0.12	0.15	0.18	0.7	SY6-0J157M-RC	500		
150	---	7343	D	9.45	0.12	0.08	0.1	0.12	1	SY4-0J157M-RD	500		
150	---	7343	E	9.45	0.12	0.08	0.12	0.12	0.5	SYE-0J157M-RE	500		
220	---	7343	D	13.86	0.18	0.12	0.16	0.18	0.5	SY5-0J227M-RD	500		
220	---	7343	E	13.86	0.12	0.08	0.12	0.12	0.7	SYE-0J227M-RE	500		
330	---	7343	D	20.79	0.24	0.16	0.2	0.24	0.5	SY6-0J337M-RD	500		
330	---	7343	E	20.79	0.12	0.08	0.12	0.12	0.4	SYE-0J337M-RE	500		
470	---	7343	D	20.79	0.12	0.08	0.12	0.12	0.4	SY8-0J477M-RD	500		
470	---	7343	E	20.79	0.12	0.08	0.12	0.12	0.4	SYE-0J477M-RE	500		

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新的设计建议选择具有较高电压和相同容量较小的产量。

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标准等级 (Standard ratings)

额定电压 Rated voltage (V)	额定容量 Rated capacitance (μ F) (120Hz)	标志 Marking	外观尺寸 EIA size code	尺寸代码 ELAN size code	漏电流 Leakage current (μ A, or less)	损失角变化范围 Tangent of the loss angle (less) (120Hz)				E. S. R (Ω) (100KHz)	系列号 ELNA Part No.	包装数量 Taping minimum packing pcs. (pcs/reel)	备注 Note
						- 55 $^{\circ}$ C	25 $^{\circ}$ C	85 $^{\circ}$ C	125 $^{\circ}$ C				
						10	0.68	AW	2012				
	1	AA	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-1A105M-RP	3,000	
	1.5	AE	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-1A155M-RP	3,000	
	1.5	A155	3216	A	0.5	0.09	0.06	0.07	0.09	8	SY1-1A155M-RA	2,000	*
	2.2	AJ	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-1A225M-RP	3,000	
	2.2	A225	3216	A	0.5	0.09	0.06	0.08	0.09	7	SY2-1A225M-RA	2,000	
	3.3	AN	2012	P	0.5	0.12	0.08	0.1	0.12	10	SYF-1A335M-RP	3,000	
	3.3	A335	3216	A	0.5	0.09	0.06	0.08	0.09	5	SY2-1A335M-RA	2,000	
	4.7	AS	2012	P	0.5	0.12	0.08	0.1	0.12	6	SYF-1A475M-RP	3,000	
	4.7	A475	3216	A	0.5	0.09	0.06	0.08	0.09	4.5	SY3-1A475M-RA	2,000	
	4.7	---	3528	B	0.5	0.09	0.06	0.07	0.09	3	SY1-1A475M-RB	2,000	*
	6.8	AW	2012	P	0.68	0.15	0.1	0.13	0.15	6	SYF-1A685M-RP	3,000	
	6.8	A685	3216	A	0.68	0.09	0.06	0.08	0.09	3	SY4-1A685M-RA	2,000	
	6.8	---	3528	B	0.68	0.09	0.06	0.08	0.09	3	SY2-1A685M-RB	2,000	*
	10	AA	2012	P	1	0.21	0.14	0.18	0.21	6	SYF-1A106M-RP	3,000	
	10	A106	3216	A	1	0.12	0.08	0.1	0.12	3	SY5-1A106M-RA	2,000	
	10	---	3528	B	1	0.09	0.06	0.08	0.09	2	SY3-1A106M-RB	2,000	
	15	A156	3216	A	1.5	0.15	0.1	0.13	0.15	3	SY6-1A156M-RA	2,000	
	15	---	3528	B	1.5	0.09	0.06	0.08	0.09	2	SY4-1A156M-RB	2,000	
	15	---	6032	C	1.5	0.09	0.06	0.07	0.09	1	SY1-1A156M-RC	500	*
	22	A226	3216	A	2.2	0.18	0.12	0.16	0.18	2.5	SY7-1A226M-RA	2,000	
	22	---	3528	B	2.2	0.12	0.08	0.1	0.12	2	SY5-1A226M-RB	2,000	
	22	---	6032	C	2.2	0.09	0.06	0.08	0.09	1	SY2-1A226M-RC	500	
	33	---	3528	B	3.3	0.12	0.08	0.1	0.12	1.5	SY6-1A336M-RB	2,000	
	33	---	6032	C	3.3	0.09	0.06	0.08	0.09	1	SY3-1A336M-RC	500	
	33	---	7343	D	3.3	0.09	0.06	0.07	0.09	0.7	SY1-1A336M-RD	500	
	47	---	3528	B	4.7	0.15	0.1	0.13	0.15	1	SY7-1A476M-RB	2,000	*
	47	---	6032	C	4.7	0.09	0.06	0.08	0.09	0.9	SY4-1A476M-RC	500	
	47	---	7343	D	4.7	0.09	0.06	0.08	0.09	0.8	SY2-1A476M-RD	500	
	68	---	6032	C	6.8	0.12	0.08	0.1	0.12	0.8	SY5-1A686M-RC	500	
	68	---	7343	D	6.8	0.09	0.06	0.08	0.09	0.6	SY3-1A686M-RD	500	
	100	---	6032	C	10	0.15	0.1	0.13	0.15	0.7	SY6-1A107M-RC	500	
	100	---	7343	D	10	0.12	0.08	0.1	0.12	0.6	SY4-1A107M-RD	500	
	150	---	7343	D	15	0.15	0.1	0.13	0.15	0.7	SY5-1A157M-RD	500	
	150	---	7343	E	15	0.12	0.08	0.12	0.12	0.7	SYE-1A157M-RE	500	
	220	---	6032	C	22	0.12	0.08	0.12	0.12	0.9	SY7-1A227M-RC	500	
	220	---	7343	D	22	0.12	0.08	0.12	0.12	0.5	SY8-1A227M-RD	500	
	220	---	7343	E	22	0.12	0.08	0.12	0.12	0.5	SYE-1A227M-RE	500	
	330	---	7343	D	33	0.12	0.08	0.12	0.12	0.5	SY8-1A227M-RD	500	
	330	---	7343	E	33	0.12	0.08	0.12	0.12	0.5	SYE-1A227M-RE	500	

说明中连续星号表示由于小型化制造减少班次等。

The asterisk in the Note row indicates the reduced frequency of manufacture due to miniaturization, etc.

新的设计建议选择具有较高电压和相同容量较小的产量。

For new design, it is recommended to choose a smaller product with a higher voltage and same capacity.

Note .

• Design, Specification are subject to change without notice.

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Tantalum Chip Capacitors



CA45树脂塑封片式电容器 (Resin mold chip type capacitors) 标准型 (Standard Type)

标准等级 (Standard ratings)

额定电压 Rated voltage (V)	额定容量 Rated capacitance (μ F) (120Hz)	标志 Marking	外观尺寸 EIA size code	尺寸代码 ELAN size code	漏电流 Leakage current (μ A, or less)	损失角变化范围 Tangent of the loss angle (less) (120Hz)				E. S. R (Ω) (100KHz)	系列号 ELNA Part No.	包装数量 Taping minimum packing pcs. (pcs/reel)	备注 Note	
						- 55°C	25°C	85°C	125°C					
16	0.33	CN	2012	P	0.5	0.09	0.06	0.07	0.09	28	SYF-1C334M-RP	3,000		
	0.47	CS	2012	P	0.5	0.09	0.06	0.07	0.09	28	SYF-1C474M-RP	3,000		
	0.68	CW	2012	P	0.5	0.09	0.06	0.07	0.09	28	SYF-1C684M-RP	3,000		
	1	CA	2012	P	0.5	0.09	0.06	0.07	0.09	25	SYF-1C105M-RP	3,000		
	1	C105	3216	A	0.5	0.09	0.05	0.07	0.09	7	SY1-1C105M-RA	2,000		
	1.5	CE	2012	P	0.5	0.12	0.08	0.1	0.12	20	SYF-1C155M-RP	3,000		
	1.5	C155	3216	A	0.5	0.09	0.06	0.08	0.09	7	SY2-1C155M-RA	2,000		
	2.2	CJ	2012	P	0.5	0.12	0.08	0.1	0.12	20	SYF-1C225M-RP	3,000		
	2.2	C225	3216	A	0.5	0.09	0.06	0.08	0.09	5	SY2-1C225M-RA	2,000		
	3.3	C335	3216	A	0.5	0.09	0.06	0.08	0.09	4.5	SY3-1C335M-RA	2,000		
	3.3	---	---	3528	B	0.5	0.09	0.06	0.07	0.09	3	SY1-1C335M-RB	2,000	*
	4.7	C475	3216	A	0.75	0.09	0.06	0.08	0.09	4	SY4-1C475M-RA	2,000		
	4.7	---	---	3528	B	0.75	0.09	0.06	0.08	0.09	3	SY2-1C475M-RB	2,000	*
	6.8	C685	3216	A	1.08	0.12	0.08	0.1	0.12	3.5	SY5-1C685M-RA	2,000		
	6.8	---	---	3528	B	1.08	0.09	0.06	0.08	0.09	2.5	SY3-1C685M-RB	2,000	
	10	C106	3216	A	1.6	0.12	0.08	0.1	0.12	4	SY6-1C106M-RA	2,000		
	10	---	---	3528	B	1.6	0.09	0.06	0.08	0.09	2	SY4-1C106M-RB	2,000	
	10	---	---	6032	C	1.6	0.09	0.06	0.07	0.09	2.2	SY1-1C106M-RC	500	*
	15	---	---	3528	B	2.4	0.09	0.06	0.08	0.09	2	SY5-1C156M-RB	2,000	
	15	---	---	6032	C	2.4	0.09	0.06	0.08	0.09	2	SY2-1C156M-RC	500	*
	22	---	---	3528	B	3.52	0.12	0.08	0.1	0.12	2	SY6-1C226M-RB	2,000	
	22	---	---	6032	C	3.52	0.09	0.06	0.08	0.09	1	SY3-1C226M-RC	500	
	22	---	---	7343	D	3.52	0.09	0.06	0.07	0.09	0.7	SY1-1C226M-RD	500	*
	33	---	---	6032	C	5.28	0.09	0.06	0.08	0.09	1.1	SY4-1C336M-RC	500	
	33	---	---	7343	D	5.28	0.09	0.06	0.08	0.09	1	SY2-1C336M-RD	500	*
	47	---	---	6032	C	7.52	0.12	0.08	0.1	0.12	0.8	SY5-1C476M-RC	500	
47	---	---	7343	D	7.52	0.09	0.06	0.08	0.09	0.7	SY3-1C476M-RD	500		
68	---	---	7343	D	10.08	0.09	0.06	0.08	0.09	0.6	SY4-1C686M-RD	500		
100	---	---	7343	D	16	0.15	0.1	0.13	0.15	0.6	SY5-1C107M-RD	500		
100	---	---	7343	E	16	0.12	0.08	0.12	0.12	0.7	SYE-1C107M-RE	500		
150	---	---	7343	D	24	0.12	0.08	0.12	0.12	0.7	SY8-1C157M-RD	500		
150	---	---	7343	E	24	0.12	0.08	0.12	0.12	0.5	SYE-1C157M-RE	500		
20	0.6	D684	3216	A	0.5	0.09	0.05	0.06	0.09	10	SY1-1D684M-RA	2,000	*	
	1	D105	3216	A	0.5	0.09	0.05	0.06	0.09	7.5	SY2-1D105M-RA	2,000		
	1.5	D155	3216	A	0.5	0.09	0.06	0.08	0.09	6	SY2-1D155M-RA	2,000		
	2.2	D225	3216	A	0.5	0.09	0.06	0.08	0.09	5	SY3-1D225M-RA	2,000		
	2.2	---	---	3528	B	0.5	0.09	0.06	0.07	0.09	5	SY1-1D225M-RB	2,000	*
	3.3	D335	3216	A	0.66	0.09	0.06	0.08	0.09	4	SY4-1D335M-RA	2,000		
	3.3	---	---	3528	B	0.66	0.09	0.06	0.08	0.09	3.8	SY2-1D335M-RB	2,000	
	4.7	D475	3216	A	0.94	0.09	0.06	0.08	0.09	4	SY5-1D475M-RA	2,000		
	4.7	---	---	3528	B	0.94	0.09	0.06	0.08	0.09	3	SY3-1D475M-RB	2,000	
	6.8	D685	3216	A	1.36	0.12	0.08	0.1	0.12	4	SY6-1D685M-RA	2,000		
	6.8	---	---	3528	B	1.36	0.09	0.06	0.08	0.09	3	SY4-1D685M-RB	2,000	
	6.8	---	---	6032	C	1.36	0.09	0.06	0.07	0.09	2.5	SY1-1D685M-RC	500	*
	10	---	---	3528	B	2	0.09	0.06	0.08	0.09	2	SY5-1D106M-RB	2,000	
	10	---	---	6032	C	2	0.09	0.06	0.08	0.09	2.5	SY2-1D106M-RC	500	
	15	---	---	6032	C	3	0.09	0.06	0.08	0.09	1.7	SY3-1D156M-RC	500	
	15	---	---	7343	D	3	0.09	0.06	0.07	0.09	2	SY1-1D156M-RD	500	*
	22	---	---	6032	C	4.4	0.09	0.06	0.08	0.09	1.5	SY4-1D226M-RC	500	
	22	---	---	7343	D	4.4	0.09	0.06	0.08	0.09	0.8	SY2-1D226M-RD	500	
	33	---	---	7343	D	6.6	0.09	0.06	0.08	0.09	0.7	SY3-1D336M-RD	500	
	47	---	---	7343	D	9.4	0.09	0.06	0.08	0.09	0.7	SY4-1D476M-RD	500	
	47	---	---	7343	E	9.4	0.1	0.06	0.1	0.1	0.7	SYE-1D476M-RE	500	
	68	---	---	7343	D	13.6	0.1	0.06	0.1	0.1	0.7	SY8-1D686M-RD	500	
	68	---	---	7343	E	13.6	0.1	0.06	0.1	0.1	0.7	SYE-1D686M-RE	500	
	100	---	---	7343	E	20	0.12	0.08	0.12	0.12	0.5	SYE-1D107M-RE	500	
	150	---	---	7343	E	30	0.12	0.08	0.12	0.12	0.5	SYE-1D157M-RE	500	

说明中连续星号表示由于小型化制造减少班次等。

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新的设计建议选择具有较高电压和相同容量较小的产量。

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Tantalum Chip Capacitors

CA45树脂塑封片式电容器 (Resin mold chip type capacitors) 标准型 (Standard Type)

标准等级 (Standard ratings)

额定电压 Rated voltage (V)	额定容量 Rated capacitance (μF) (120Hz)	标志Marking	外观尺寸 EIA size code	尺寸代码 ELAN size code	漏电流 Leakage current (μA, or less)	损失角变化范围 Tangent of the loss angle(less) (120Hz)				E.S.R (Ω) (100KHz)	系列号 ELNA Part No.	包装数量Taping minimum packing pcs. (pcs/reel)	备注 Note
						- 55℃	25℃	85℃	125℃				
25	0.47	E474	3216	A	0.5	0.09	0.05	0.06	0.09	10	SY1-1E474M-RA	2,000	*
	0.68	E684	3216	A	0.5	0.09	0.05	0.06	0.09	9	SY2-1E684M-RA	2,000	
	1	E105	3216	A	0.5	0.09	0.06	0.08	0.09	7	SY2-1E105M-RA	2,000	
	1.5	E155	3216	A	0.5	0.09	0.06	0.08	0.09	6.5	SY3-1E155M-RA	2,000	
	1.5	---	3528	B	0.5	0.09	0.06	0.07	0.09	5	SY1-1E155M-RB	2,000	
	2.2	E225	3216	A	0.55	0.09	0.06	0.08	0.09	6	SY4-1E225M-RA	2,000	
	2.2	---	3528	B	0.55	0.09	0.06	0.08	0.09	5	SY2-1E225M-RB	2,000	
	3.3	---	3528	B	0.82	0.09	0.06	0.08	0.09	4	SY3-1E335M-RB	2,000	
	4.7	---	3528	B	1.17	0.09	0.06	0.08	0.09	3.5	SY4-1E475M-RB	2,000	
	4.7	---	6032	C	1.17	0.09	0.06	0.07	0.09	2.5	SY2-1E475M-RC	500	
	6.8	---	3528	B	1.7	0.12	0.08	0.1	0.12	2	SY5-1E685M-RB	2,000	
	6.8	---	6032	C	1.7	0.09	0.06	0.08	0.09	2	SY2-1E685M-RC	500	
	10	---	6032	C	2.5	0.09	0.06	0.08	0.09	1.5	SY3-1E106M-RC	500	
	10	---	7343	D	2.5	0.09	0.06	0.07	0.09	1.2	SY1-1E106M-RD	500	
	15	---	6032	C	3.75	0.09	0.06	0.06	0.09	1	SY4-1E156M-RC	500	
	15	---	7343	D	3.75	0.09	0.06	0.08	0.09	1	SY2-1E156M-RD	500	
	22	---	7343	D	5.5	0.09	0.06	0.08	0.09	0.8	SY3-1E226M-RD	500	
	33	---	7343	D	8.25	0.09	0.06	0.08	0.09	0.7	SY3-1E226M-RD	500	
	33	---	7343	E	8.25	0.09	0.06	0.08	0.09	0.7	SYE-1E226M-RE	500	
	47	---	7343	D	11.75	0.1	0.06	0.1	0.1	0.7	SY8-1E476M-RD	500	
47	---	7343	E	11.75	0.1	0.06	0.1	0.1	0.7	SYE-1E476M-RE	500		
68	---	7343	E	17	0.1	0.06	0.1	0.1	0.7	SYE-1E686M-RE	500		
35	0.1	V104	3216	A	0.5	0.09	0.05	0.08	0.09	28	SY1-1V104M-RA	2,000	
	0.15	V154	3216	A	0.5	0.09	0.05	0.08	0.09	24	SY1-1V154M-RA	2,000	
	0.22	V224	3216	A	0.5	0.09	0.05	0.08	0.09	20	SY1-1V224M-RA	2,000	
	0.33	V334	3216	A	0.5	0.09	0.05	0.08	0.09	15	SY1-1V334M-RA	2,000	
	0.47	V474	3216	A	0.5	0.09	0.05	0.08	0.09	11	SY2-1V474M-RA	2,000	
	0.47	---	3528	B	0.5	0.09	0.04	0.06	0.09	11	SY1-1V474M-RB	2,000	
	0.68	V684	3216	A	0.5	0.09	0.04	0.06	0.09	8	SY2-1V684M-RA	2,000	
	0.68	---	3528	B	0.5	0.09	0.04	0.06	0.09	8	SY1-1V684M-RB	2,000	
	1	V105	3216	A	0.5	0.09	0.06	0.08	0.09	7	SY3-1V105M-RA	2,000	
	1	---	3528	B	0.5	0.09	0.04	0.06	0.09	6	SY1-1V105M-RB	2,000	
	1.5	V155	3216	A	0.52	0.09	0.06	0.08	0.09	4	SY4-1V155M-RA	2,000	
	1.5	---	3528	B	0.52	0.09	0.06	0.08	0.09	5	SY2-1V155M-RB	2,000	
	1.5	---	6032	C	0.52	0.09	0.06	0.07	0.09	4.5	SY1-1V155M-RC	500	
	2.2	---	3528	B	0.77	0.09	0.06	0.08	0.09	4	SY3-1V225M-RB	2,000	
	2.2	---	6032	C	0.77	0.09	0.06	0.07	0.09	3.5	SY1-1V225M-RC	500	
	3.3	---	3528	B	1.15	0.09	0.06	0.08	0.09	4	SY4-1V335M-RB	2,000	
	3.3	---	6032	C	1.15	0.09	0.06	0.07	0.09	3	SY1-1V335M-RC	500	
	4.7	---	6032	C	1.64	0.09	0.06	0.08	0.09	2	SY2-1V475M-RC	500	
	4.7	---	7343	D	1.64	0.09	0.06	0.07	0.09	1.5	SY1-1V475M-RD	500	
	6.8	---	6032	C	2.38	0.09	0.06	0.08	0.09	1.8	SY3-1V685M-RC	500	
6.8	---	7343	D	2.38	0.09	0.06	0.07	0.09	1.3	SY1-1V685M-RD	500		
10	---	6032	C	3.5	0.09	0.06	0.07	0.09	1.5	SY4-1V106M-RC	500		
10	---	7343	D	3.5	0.09	0.06	0.08	0.09	1	SY2-1V106M-RD	500		
15	---	7343	D	5.25	0.09	0.06	0.08	0.09	0.8	SY3-1V156M-RD	500		
15	---	7343	E	5.25	0.09	0.06	0.08	0.09	0.8	SYE-1V156M-RE	500		
22	---	7343	D	7.7	0.12	0.08	0.1	0.12	0.7	SY4-1V226M-RD	500		
22	---	7343	E	7.7	0.12	0.08	0.1	0.12	0.7	SYE-1V226M-RE	500		
50	0.22	H224	3216	A	0.11	0.06	0.04	0.06	0.06	15	SY1-1H224M-RA	2,000	
	0.33	H334	3216	A	0.165	0.06	0.04	0.06	0.06	10	SY2-1H334M-RA	2,000	
	0.47	H474	3216	A	0.235	0.06	0.04	0.06	0.06	9	SY2-1H474M-RA	2,000	
	0.68	H684	3216	A	0.34	0.06	0.04	0.06	0.06	8	SY3-1H684M-RA	2,000	
	0.68	---	3528	B	0.34	0.06	0.04	0.06	0.06	8	SY1-1H684M-RB	2,000	
	1	---	3528	B	0.5	0.06	0.04	0.06	0.06	7	SY2-1H105M-RB	2,000	
	1.5	---	3528	B	0.75	0.1	0.06	0.1	0.1	4.5	SY3-1H155M-RB	2,000	
	2.2	---	3528	B	1.1	0.1	0.06	0.1	0.1	3	SY4-1H225M-RB	2,000	
	3.3	---	6032	C	1.65	0.1	0.06	0.1	0.1	2.5	SY2-1H335M-RC	500	
	4.7	---	6032	C	2.35	0.1	0.06	0.1	0.1	1.4	SY3-1H475M-RC	500	
	6.8	---	7343	D	3.4	0.1	0.06	0.1	0.1	1	SY2-1H685M-RD	500	
	6.8	---	7343	E	3.4	0.1	0.06	0.1	0.1	1	SYE-1H684M-RE	500	
	10	---	7343	D	5	0.1	0.06	0.1	0.1	0.8	SY3-1H106M-RD	500	
	10	---	7343	E	5	0.1	0.06	0.1	0.1	0.7	SYE-1H106M-RE	500	

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Tantalum Chip Capacitors



CA45树脂塑封片式电容器 (Resin mold chip type capacitors) 绿色 (GREEN CAP) 低ESR (LOW ESR)

标准等级 (Standard ratings)

SYL 型 (低 ESR) Type SYL (LOW ESR)

额定电压 Rated voltage (V)	额定容量 Rated capacitance (μF) (120Hz)	标志 Marking (P, A)	外观尺寸 EIA size code	尺寸代码 ELAN size code	漏电流 Leakage current (μA, or less)	损失角变化范围Tangent of the loss angle (less) (120Hz)				E. S. R (Ω) (100kHz)	Allouable Ripple Current (Arms) (100kHz)	系列号 ELNA Part No.	包装数量 Taping minimum packing pcs. (pcs/reel)	
						- 55℃	20℃	85℃	125℃					
4	10	GA	2016	P	0.5	0.15	0.1	0.12	0.15	1.2	0.13	SYL-0G106M-RP	3,000	
	33	G226	3216	A	0.88	0.15	0.1	0.12	0.15	0.8	0.19	SYL-0G336M-RA	2,000	
	47	G336	3216	A	1.32	0.15	0.1	0.13	0.15	0.8	0.19	SYL-0G476M-RA	2,000	
	47	G476	3528	B	1.88	0.12	0.08	0.1	0.12	0.8	0.19	SYL-0G476M-RB	2,000	
	100	---	---	3528	B	4	0.15	0.1	0.13	0.15	0.7	0.21	SYL-0G107M-RB	2,000
	100	---	---	6032	C	4	0.12	0.08	0.1	0.12	0.3	0.41	SYL-0G107M-RC	500
	220	---	---	7343	D	8.8	0.12	0.08	0.1	0.12	0.1	0.87	SYL-0G227M-RD	500
330	---	---	7343	D	13.2	0.21	0.14	0.18	0.21	0.1	0.87	SYL-0G337M-RD	500	
6.3	3.3	JN	2012	P	0.5	0.12	0.08	0.096	0.12	3	0.09	SYL-0J335M-RP	3,000	
	4.7	JS	2012	P	0.5	0.12	0.08	0.096	0.12	2	0.1	SYL-0J475M-RP	3,000	
	10	JA	2012	P	0.63	0.15	0.1	0.12	0.15	1.2	0.13	SYL-0J106M-RP	3,000	
	10	J106	3216	A	0.63	0.12	0.08	0.1	0.12	1.2	0.16	SYL-0J106M-RA	2,000	
	22	J226	3216	A	1.38	0.15	0.1	0.13	0.15	0.8	0.19	SYL-0J226M-RA	2,000	
	33	J336	3216	A	2.07	0.15	0.1	0.13	0.15	0.8	0.19	SYL-0J336M-RA	2,000	
	33	---	---	3528	B	2.07	0.12	0.08	0.1	0.12	0.8	0.19	SYL-0J336M-RB	2,000
	47	---	---	3528	B	2.96	0.15	0.1	0.13	0.15	1	0.17	SYL-0J476M-RB	2,000
	47	---	---	6032	C	2.96	0.09	0.06	0.08	0.09	0.4	0.35	SYL-0J476M-RC	500
	100	---	---	3528	B	6.3	0.18	0.12	0.15	0.18	0.7	0.21	SYL-0J107M-RB	2,000
	100	---	---	6032	C	6.3	0.15	0.1	0.13	0.15	0.25	0.45	SYL-0J107M-RC	500
100	---	---	7343	D	6.3	0.12	0.08	0.1	0.12	0.15	0.46	SYL-0J107M-RD	500	
220	---	---	7343	D	13.9	0.18	0.12	0.16	0.18	0.1	0.79	SYL-0J227M-RD	500	
10	2.2	AJ	2012	P	0.5	0.12	0.08	0.1	0.12	5	0.07	SYL-1A225M-RP	3,000	
	4.7	A475	3216	A	0.5	0.09	0.06	0.08	0.09	2	0.12	SYL-1A475M-RA	2,000	
	10	A106	3216	A	1	0.12	0.08	0.1	0.12	1	0.15	SYL-1A106M-RA	2,000	
	22	---	3528	B	2.2	0.12	0.08	0.1	0.12	1	0.17	SYL-1A226M-RB	2,000	
	33	---	3528	B	3.3	0.12	0.08	0.1	0.12	0.8	0.19	SYL-1A336M-RB	2,000	
	33	---	6032	C	3.3	0.09	0.06	0.08	0.09	0.375	0.37	SYL-1A336M-RC	500	
	47	---	3528	B	4.7	0.15	0.1	0.13	0.15	0.7	0.21	SYL-1A476M-RB	2,000	
	47	---	6032	C	4.7	0.09	0.06	0.08	0.09	0.4	0.35	SYL-1A476M-RC	500	
	47	---	7343	D	4.7	0.09	0.06	0.08	0.09	0.3	0.5	SYL-1A476M-RD	500	
	100	---	7343	D	10	0.12	0.08	0.1	0.12	0.12	0.79	SYL-1A107M-RD	500	
150	---	7343	D	15	0.15	0.1	0.13	0.15	0.12	0.79	SYL-1A157M-RD	500		
16	1	CA	2012	P	0.5	0.09	0.06	0.072	0.09	5	0.06	SYL-1C105M-RP	3,000	
	2.2	CJ	2012	P	0.5	0.12	0.08	0.096	0.12	5	0.06	SYL-1C225M-RP	3,000	
	3.3	C335	3216	A	0.5	0.09	0.06	0.08	0.09	1.8	0.13	SYL-1C335M-RA	2,000	
	4.7	C475	3216	A	0.75	0.09	0.06	0.08	0.09	1.8	0.13	SYL-1C475M-RA	2,000	
	4.7	---	3528	B	0.75	0.09	0.06	0.08	0.09	1.8	0.13	SYL-1C475M-RB	2,000	
	10	---	3528	B	1.6	0.09	0.06	0.08	0.09	1	0.17	SYL-1C106M-RB	2,000	
	10	---	6032	C	1.6	0.09	0.06	0.08	0.09	0.9	0.24	SYL-1C106M-RC	500	
	22	---	6032	C	3.52	0.09	0.06	0.08	0.09	0.4	0.35	SYL-1C226M-RC	500	
	33	---	6032	C	5.28	0.09	0.06	0.08	0.09	0.4	0.35	SYL-1C336M-RC	500	
	33	---	7343	D	5.28	0.09	0.06	0.08	0.09	0.25	0.55	SYL-1C336M-RD	500	
	47	---	7343	D	7.52	0.09	0.06	0.08	0.09	0.2	0.61	SYL-1C476M-RD	500	

尺寸ESR值 Case size & ESR(Ω)

额定容量 Rated capacitance (uf)	4V	6.3V	10V	16V
1				P(5.0)
2.2			P(5.0)	P(5.0)
3.3		P(3.0)		A(1.8)
4.7		P(2.0)	A(2.0)	A(1.8), B(1.8)
10	P(1.2)	P(1.2), A(1.2)	A(1.0)	B(1.0), C(0.9)
22		A(0.8)	B(1.0)	C(0.4)
33	A(0.8)	A(0.8), B(0.8)	B(0.8), C(0.375)	C(0.4), D(0.25)
47	A(0.8), B(0.8)	B(1.0), C(0.4)	B(0.7), C(0.4), D(0.3)	D(0.2)
100	B(0.7), C(0.3)	B(0.7), C(0.25), D(0.15)	D(0.12)	
150			D(0.12)	
220	D(0.1)	D(0.1)		
330	D(0.1)			

Note .

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制造一个芯片电容器，金属钽粉和钽引线的组成，然后在真空中烧结，通过电化学方式氧化；在钽表面形成 Ta_2O_5 ，作为介质。

介质表面，形成一层固体二氧化锰层作为阴极层。作为二氧化锰层的引出层，碳层和导电银层。

To manufacture a tantalum chip capacitor, metallic tantalum (Ta) powder is pressed and formed with a tantalum lead wire, and then sintered in a vacuum; by the electrochemical anodic oxidation, tantalum oxide film (Ta_2O_5) is formed on the fired surface; this oxide is used as the dielectric.

On top of the dielectric, a solid manganese dioxide layer (MnO_2) is formed as the electrolyte through the thermal decomposition of manganese nitrate.

To make an electrical connection on the manganese dioxide layer, a graphite layer and a conductive adhesive are used to fix a cathode lead.

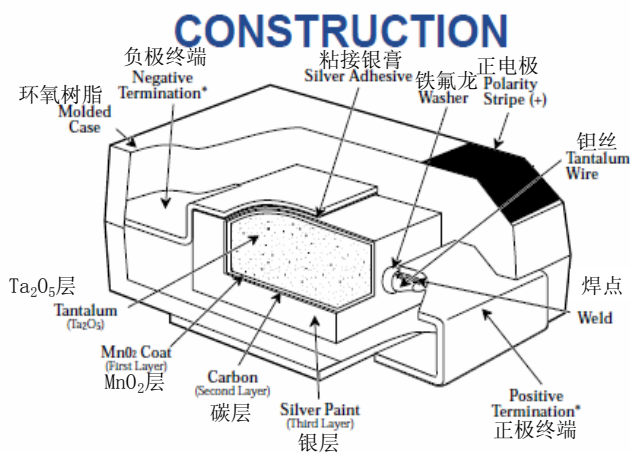


Fig.1 Diagrammatic sketch and Structure of a tantalum electrolytic capacitor

■片式钽电容器工作条件和可靠性（故障率）

钽电容器芯片中电气特性是耐高温和稳定的，并预计有很长的寿命。

因为钽及钽氧化膜是非常稳定的，二氧化锰作为一个固体电解质，也是一个稳定的无机固体。

另一方面，它们往往也会突然失效，因为氧化膜非常薄，是固体物质。

因此，它的故障率曲线，从一开始就逐渐衰退。不同于特定的铝电解电容器的浴缸曲线。

■Working conditions and reliability (failure rate) of tantalum chip capacitors

Tantalum chip capacitors basically have high temperature resistance and stable electrical characteristics, and is expected to have a long life, because tantalum and tantalum oxidized films are extremely stable, and manganese dioxide serving as a solid electrolyte is also a stable inorganic solid.

On the other side, they tend to have a sudden failure because the tantalum oxidized films serving as an electrolyte are very thin and solid elements.

downturn from the beginning, different from a bathtub shaped curve specific to the aluminum electrolytic capacitors.

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超过90%片式钽电容器的故障是发生于漏电流增大或短路。

可靠性是受固体钽电容器芯片和环境条件中各种影响。这些电容器特别受到环境温度、电压（工作电压）和电路电阻的影响。

■环境温度，电压（工作电压），可靠性

固体钽电解电容器可靠性（故障率）一般与温度电压权数的自然对数成正比。估算故障率可以表示为下面公式

$$\lambda = \lambda_0 \left(\frac{V}{V_0} \right)^n \cdot 2^{\left(\frac{T-T_0}{F} \right)}$$

λ :基本失效率.
 n :电容式因素.
 F :电容式因素.
 T :工作温度.
 T_0 :上限类别温度.
 V :工作电压.
 V_0 :额定电压.

固体钽电解电容器，它已证实，N 和 F 分别在部分基础上是3和15，这个公式，在图2中所示。

在图中；

垂直线： 实际故障率 λ_0
 故障率在 $T_0=85^\circ\text{C}$
 V_0 =额定电压

水平线： 实际工作温度

每一行的参数（工作电压/额定电压）所示的电压下降的因素。

■串联电路中的电阻各可靠性

用一个电容器连接的电阻降低了电容器的介质膜的电力负荷。

这是因为它控制的充电和放电的电容器。

即串联电阻越大越减少介质膜的负荷。

因此，得到更高的可靠性。

串联电路中的串联电阻各可靠性的关系（故障率）显示在图3中。

在图中；

垂直线： 假定1，当失败率为 $3\Omega/V$

水平线： 电阻值应用电压

More than 90% of tantalum chip capacitor failures are caused by increased leakage current or short circuits. Reliability is affected by various conditions for solid tantalum chip capacitors and environmental conditions. These capacitors are particularly affected by ambient temperatures, applied voltage (working voltage), and circuit resistance.

■Ambient temperature, applied voltage (working voltage), and reliability

Reliability (failure rate) of solid tantalum electrolytic capacitors is generally proportional to the powers of temperature and powers of voltage in natural logarithm. An estimated failure rate is expressed by the following formula.

$$\lambda = \lambda_0 \left(\frac{V}{V_0} \right)^n \cdot 2^{\left(\frac{T-T_0}{F} \right)}$$

λ :Basic failure rate.
 n :Factor for capacitor type.
 F :Factor for capacitor type.
 T :Working temperature.
 T_0 :Upper category temperature.
 V :Working voltage.
 V_0 :Rated voltage.

For solid tantalum electrolytic capacitors, it has been confirmed that n and F are 3 and 15 respectively on an experimental basis. This easy formula is illustrated in Fig. 2.

In the figure;

Vertical lines :Actual failure rate to failure rate λ_0 which is the failure rate at $T_0=85^\circ\text{C}$ and V_0 =Rated voltage

Horizontal lines:Actual working temperature

The parameter of each line [working voltage/rated voltage] shows the voltage reduction factor.

■Series circuit resistance and reliability

A resistance connected with a capacitor reduces the electrical load to the dielectric film of the capacitor.

This occurs because it controls the charging and discharging current of the capacitor.

Namely, the greater the series resistance, the greater the electrical load reduction to the dielectric film.

Thus, resulting in higher reliability

The relationship between a series resistance and reliability (failure rate) is shown in Fig. 3.

In the figure;

Vertical lines :Ratio when the failure for $3\Omega/V$ is assumed to be 1.

Horizontal lines:Resistance value per volt of applied voltage.

Note .

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Tantalum Chip Capacitors

ELEA TANTALUM CHIP CAPACITORS (CHIPCON)

■ 失败率在实际工作条件下的估算

电子部件的可靠性善通表现出的故障率

$$\text{失败率} = \frac{\text{失败数}}{\text{工作时间} \times \text{运行中的元件数量}} \times 100$$

(%1000 小时)

注意：工作单位的时间为1000小时

失败率设定：对于我们产量，失败率设定在如下条件

设定失败率的条件标准		(A) 失败率设定
应用电压	额定电压	1000小时1%，（60%可靠性水平）
工作温度	85°C	
串联电阻值	3 Ω/V	

没有实际工作时间比例：它的可靠性在实际工作时间不可计算的预测从图2和图3的参数的计算公式。

在实际工作时间的估算故障率（%100小时）=A*B*C

- A=设定故障率
- B=工作电压；减少温度指数（参考图2）
- C=电路阻力系数（参考图3）

例如计算：A 壳 SY 16V10μF 容量偏差±20%，电容器用于下列情况计算：

- 工作条件：适用电压：9.6v；
- 工作温度：50°C；0.043
- 来自图2；
- 电路阻力系数：2 Ω/V；1.7
- 来自图3；
- 估计故障率：1*0.043*1.7=0.073（%/1000 hours）

平均故障时间：如果函数的可靠性(Rt)

遵守指数公布，失败率将保持不变。

任何部分的原故障时间（平均故障时间）将是失败率倒数。

$$\text{平均故障时间} = \frac{1}{\text{平均故障率}}$$

■ Estimation of the failure rate under actual working conditions

Reliability of electronic parts is generally shown by the failure rate;

$$\text{failure Rate} = \frac{\text{Number of failure parts}}{\text{Working hours} \times \text{Number of components in operation}} \times 100$$

(%1000 hours)

Note: The unit of working hours to be 1000 hours.

Failure rate setting; For our products, failure rates are set under the following conditions.

Standard conditions for setting the failure rates		(A) Failure the setting
Applied voltage	Rated Voltage	1%/1000 hours (60% reliability level)
Working temperature	85°C	
Circuit resistance	3 Ω/V	

Failure rate of actual working time: A prediction of reliability in actual working time can be calculated form coefficients in Fig.3 and Fig.4 and the calculation formula.

Estimated failure rate in actual working time (%/1000 hours)=A*B*C

- A=Set failure rate
- B=Working voltage; Reduction index of temperature (refer to Fig. 2)
- C=Circuit resistance coefficient (refer to Fig. 3)

Example of calculation: A Type SY 16V10uF capacitor with a capacitance tolerance of ±20% is used under the following conditions:

- Working conditions: Applied voltage: 9.6v;
- Working temperature: 50°C; 0.043
- from Fig. 2;
- Circuit resistance: 2 Ω/V; 1.7
- from Fig. 3;
- Estimated failure rate: 1*0.043*1.7=0.073（%/1000 hours）

Mean time of failure: If the reliability function (Rt)

abides by the exponential

distribution, the failure rate will be constant in any section and the MTTF (Mean Time to Failures) will be the inverse number of the failure rate,

$$\text{MTTF} = \frac{1}{\text{Mean Failure Rate}}$$

Note .

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Tantalum Chip Capacitors

■ 失败率在实际工作条件中的估算

电子部件的可靠性普通表现出的故障率

ELEA TANTALUM CHIP CAPACITORS (CHIPCON)

■ Estimation of the failure rate under actual working conditions

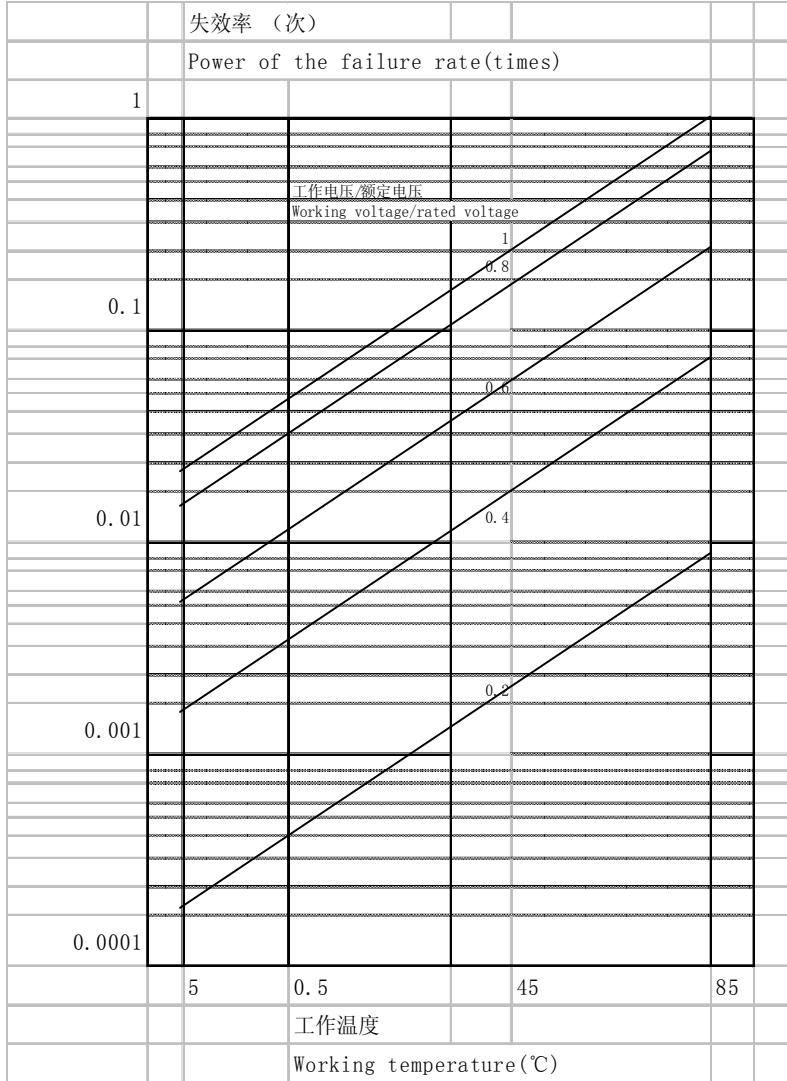


图3. 工作温度, 电压, 和故障率的关系

Fig. 2 Relationship between the working temperature, applied voltage, and the failure rate.

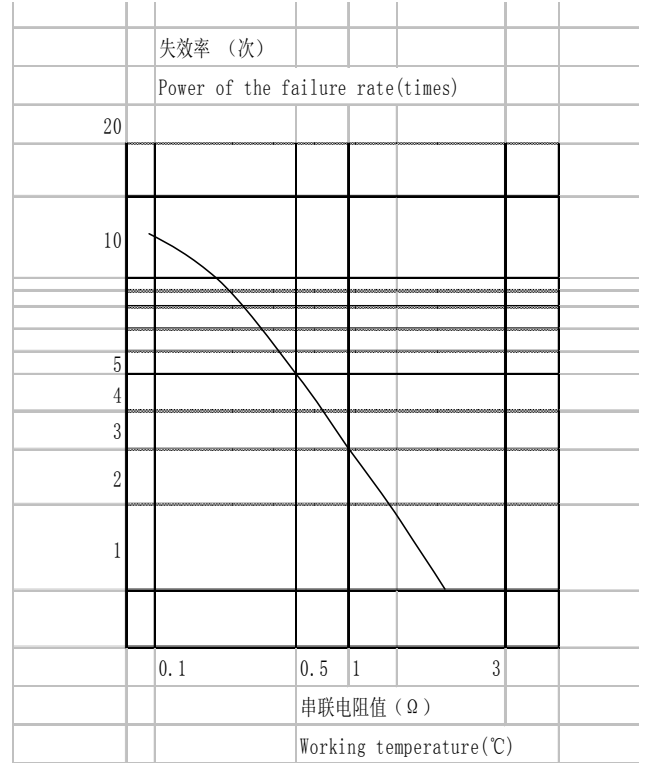


图3. 串联电路中电阻和失败率之间的关系

Fig. 3 Relationship between the series circuit resistance and failure rate.

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Tantalum Chip Capacitors

■纹波能力

纹波固体钽电解电容器的电容能力考虑到的等效串联电阻 (ESR)
 由于纹波电源会产生热量致使电容器的内部能量损失。允许的纹波电源是决定产生的热量，由于电容的内部电阻和热排放树脂的模具引线框架平衡等等。
 允许的纹波电源变化受电容，分解环境温度，外表尺寸的影响等等。

热值P，由于电容器的内部损失的纹波电流表示如下：

$$P=I^2R=\frac{V^2}{Z^2}R\cdots\cdots\cdots\textcircled{1}$$

Where P:产生的热量(V)
 I:纹波电流(Arms)
 R:ESR(Ω)
 V:纹波电压(Vrms)
 Z:阻抗(Ω)

由于温度上升产生的热量是表示如下：

$$\Delta T=\frac{P}{A \cdot H}\cdots\cdots\cdots\textcircled{2}$$

ΔT:由于温度上升产生的热量(deg)
 A:表面积(cm²)
 H:辐射系数(W/cm²·deg)

设定允许纹波电源和电压，以便允许ΔT应该是5度或以下

一般，由于固体钽电解电容器，不经常携带大量的低频电流平滑电源或类似的，允许纹波电压和电流设置，这考虑到在低频域或高频域电压和电流的影响。

■允许纹波电压和纹波电源允许在低频域

从公式 ①

$$V_{\max}=Z\sqrt{\frac{P_{\max}}{R}}\cdots\cdots\cdots\textcircled{3}$$

P_{max}:产生的最高热值
 V_{max}:最大允许纹波电压

Where (1) 直流偏置电压和最大AC应用纹波电压（最大）不能超过额定电压

(2) 直流偏置电压最小AC应用纹波电压，不能超过负电压（反反电压）

最大允许纹波电源等于除以阻抗最大允许电压

$$I_{\text{rms}}=\frac{V_{\text{rms}}}{Z}\cdots\cdots\cdots\textcircled{4}$$

$$Z=\sqrt{X^2+R^2}\cdots\cdots\cdots\textcircled{5}$$

$$X=\frac{1}{\Omega c}+\omega L\cdots\cdots\cdots\textcircled{6}$$

$$w=2\pi f, R=\frac{\tan \delta}{\Omega c}\cdots\cdots\cdots\textcircled{7}$$

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■Ripple capability

The ripple current capability of tantalum solid electrolytic capacitor takes into consideration the equivalent series resistance (ESR) and the effect of heat generation due to ripple.

Ripple current generates heat due to the internal energy loss of the capacitor.

The allowable ripple current is decided by the heat generated due the internal resistance of the capacitor and the balance of thermal discharge of the mold resin, lead frame, and the like.

The allowable ripple current is also presumed to be affected by capacitance, frequency, ambient temperature, case size, and the like.

Heat value, p, generated by ripple current due to the internal loss of the capacitor is expressed as follows.

$$P=I^2R=\frac{V^2}{Z^2}R\cdots\cdots\cdots\textcircled{1}$$

Where P:Generated heat value(V)
 I:Ripple current(Arms)
 R:ESR(Ω)
 V:Ripple voltage(Vrms)
 Z:Impedance(Ω)

Temperature rise due to heat generation is expressed as follows:

$$\Delta T=\frac{P}{A \cdot H}\cdots\cdots\cdots\textcircled{2}$$

ΔT:Temperature rise due to heat generation(deg)
 A:Surface area(cm²)
 H:Radiation coefficient(W/cm²·deg)

Set an allowable ripple current and allowable voltage so that ΔT should be 5deg or under.

In general, since the tantalum solid electrolytic capacitor does not often carry large low-frequency current for smoothing power supply or the like, allowable ripple voltage and current are set This takes into consideration the effect of voltage in the low-frequency domain and that of current in the high-frequency domain.

■Allowable ripple voltage and allowable ripple current in low-frequency domain

From Formula ①

$$V_{\max}=Z\sqrt{\frac{P_{\max}}{R}}\cdots\cdots\cdots\textcircled{3}$$

P_{max}:Maximum generated heat vale
 V_{max}:Maximum allowable ripple voltage

Where (1) The sum of DC bias voltage and the max. AC applied ripple voltage(V max) can not exceed the rated voltage

(2) The sum of the DC bias voltage and the min.AC applied ripple voltage can not be a negative voltage (reverse voltage).

The maximum allowable ripple current is obtained by dividing the maximum allowable voltage by the impedance.

$$I_{\text{rms}}=\frac{V_{\text{rms}}}{Z}\cdots\cdots\cdots\textcircled{4}$$

$$Z=\sqrt{X^2+R^2}\cdots\cdots\cdots\textcircled{5}$$

$$X=\frac{1}{\Omega c}+\omega L\cdots\cdots\cdots\textcircled{6}$$

$$w=2\pi f, R=\frac{\tan \delta}{\Omega c}\cdots\cdots\cdots\textcircled{7}$$



我们面临系统

$$Z = \sqrt{\left(\frac{1}{\omega c}\right)^2 + \left(\frac{\tan \delta}{\omega c}\right)^2}$$

$$\frac{1}{2 \pi f C} \sqrt{1 + (\tan \delta)^2}$$

由于tan δ 小到0.02到0.04范围内，低于500Hz频率或以下，因而能够忽略

从公式 8

$$Z = \frac{1}{2 \pi f C} \dots\dots\dots \textcircled{9}$$

从公式⑨ 到公式 ④

$$I_{rms} = 2 \pi f C V_{rms} \dots\dots\dots \textcircled{10}$$

容量表达.

$$I_{rms} = 2 \pi f C V_{rms} * 10^{-6} \dots\dots\dots \textcircled{11}$$

■ 允许纹波电源在高频域

在一个500Hz域到几百千赫，因为相当通过介质膜，由于低阻抗纹波电流通过，必须考虑所产生的热量大电流。

$$I_{rms} = \sqrt{\frac{P_{max}}{R}} \dots\dots\dots \textcircled{12}$$

允许的最大热值在20℃的大小规定如下

表1. 允许的最大热值规定如下

尺寸	允许最大热值 (W)
	SYF, SYL
P	0.022
A	0.03
B	0.03
C	0.05
D	0.075

R是在需要的频率的ESR，使用(x+3σ)安全的值实际平均同，使用作出计算标准模型中表中显示的ESR值。此外，乘以温度的补偿以考虑到环境温度系数的值。

表2. 温度补偿系数

环境温度	系数
	SYF, SY, SYL
20℃	1
50℃	0.7
85℃	0.5
105℃	—

within the range of frequency we are facing.

$$Z = \sqrt{\left(\frac{1}{\omega c}\right)^2 + \left(\frac{\tan \delta}{\omega c}\right)^2}$$

$$\frac{1}{2 \pi f C} \sqrt{1 + (\tan \delta)^2}$$

Since tanδ is as small as 0.02 to 0.04 within the low-frequency range of 500Hz or under, it is insignificant when compares to 1, therefore can be ignored.

Form formula 8

$$Z = \frac{1}{2 \pi f C} \dots\dots\dots \textcircled{9}$$

Substituting formula ⑨ for formula ④

$$I_{rms} = 2 \pi f C V_{rms} \dots\dots\dots \textcircled{10}$$

Expressing the capacity in uf.

$$I_{rms} = 2 \pi f C V_{rms} * 10^{-6} \dots\dots\dots \textcircled{11}$$

■ Allowable ripple current in high-frequency domain

In a domain of 500Hz to several hundred Khz, since considerably large current flows through dielectric film due to low inpedance, heat generated by ripple current must be taken into consideration.

$$I_{rms} = \sqrt{\frac{P_{max}}{R}} \dots\dots\dots \textcircled{12}$$

The allowable maximum heat values generated at 20℃ have been decided by case size as follows.

Table 1. Allowable maximum heat values by case size

Case Size	Allowable maximum heat values Pmax (W)
	SYF, SYL
P	0.022
A	0.03
B	0.03
C	0.05
D	0.075

Where, R is ESR at a required frequency. Use (x+3σ) of actual average value for safety. Make a calculation using ESR values shown in the standard model table.

Furthermore, multiply the value by a temperature compensation coefficient taking heat radiation according to ambient temperature into consideration.

Table 2. Temperature compensation coefficient

Ambient temperature	Coefficient
	SYF, SY, SYL
20℃	1
50℃	0.7
85℃	0.5
105℃	—

Note .

- Design, Specification are subject to change without notice.
- Ask factory for technical specifications before purchase and /or use.



Tantalum Chip Capacitors

■ 焊接

1. 建议芯片类零件应按下列条件焊接
在很短的时间及低温下尽可能焊接。

(1) 焊接浸渍法

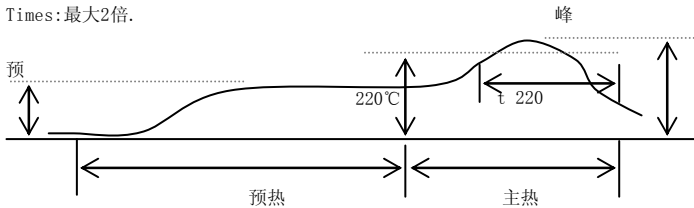
焊接温度 : 不超过 260°C

浸渍时间: 不超过 5s

(2) 回流法

根据回流温度如下所示条件。

Times: 最大2倍.



		SYF, SY, SYL
T pre	预热温度	160~180°C
T peak	最高温度	250°C (Max.)
t pre	预热时间	100s (Max.)
t main	最热时间	50s (Max.)
t 220	220°C焊接时间	40s (Max.)
t peak	最高温度时间	3s (Max.)

建议焊接峰值235 to 250°C.

虽然向上加热, 如由一加热板导致, 不会任何问题
一个以红外线方式向下加热大气炉, 可以提高电容器温度,
表面温度比基体温度高。
因此, 必须谨慎。

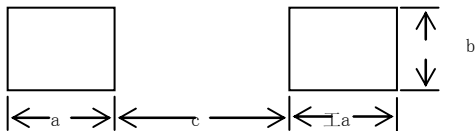
2. 使用尽可能预热, 并减轻焊接温度梯度。

3. 使用树脂运载

4. 对于回流焊方法, 如果焊接面积太大与电容器引脚
面积接触大, 电容器有可能滑倒或掉出。
因而必须尽量谨慎。

5. 浸入式的焊接方法, 因为高密度封装, 有时对可焊性造成不利影响
考虑采取措施, 例如清除空气。

6. 建议垫的模式和尺寸。



Unit:mm

Case Size	a		b	c
	浸焊	回流		
P	2.2	1.05	1.2	0.5
A	2.9	1.35	1.5	1.1
B	3	1.35	2.7	1.4
C	4.1	2	2.7	2.9
D	5.2	2.05	2.9	4.1

Note .

• Design, Specification are subject to change without notice.

• Ask factory for technical specifications before purchase and /or use.

■ Soldering

1. It is recommended that chip type parts be soldered within the following conditions. Soldering should be carried out in a short time and at low temperature as much as possible.

(1) Solder dipping method

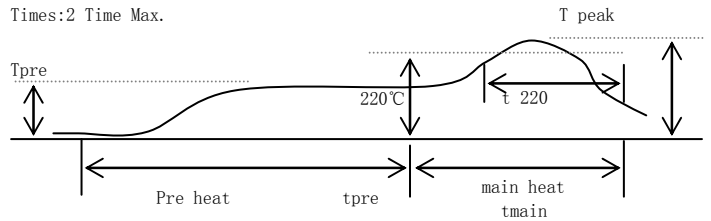
Solder temperature :Not more than 260°C

Dipping time :Not more than 5s

(2) Reflow method

According to the reflow profile conditions shown in the following.

Times: 2 Time Max.



		SYF, SY, SYL
T pre	Preheating temperature	160~180°C
T peak	Peak temperature	250°C (Max.)
t pre	Preheating time	100s (Max.)
t main	Main heating time	50s (Max.)
t 220	Time for which solder temperature exceeds 220°C	40s (Max.)
t peak	Time at peak temperature	3s (Max.)

The peak temperature of soldering recommends from 235 to 250°C.

Though upward heating, such as that by a hot plate, does not cause any problem, downward heating by an atmospheric furnace by means of infrared rays could raise the temperature of capacitors to temperatures higher than that of the substrate surface. Therefore, care must be taken.

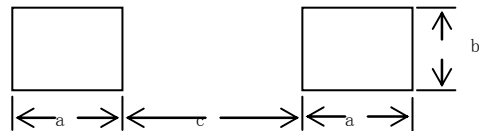
2. Use preliminary heating as far as possible, and relieve the temperature gradient for soldering.

3. Use resin flux.

4. For the reflow method, if the land area is too big in comparison with the capacitor terminal area, the capacitor is likely to slip or turn over. Therefore, caution must be taken.

5. For the solder bathing method, since high density packaging sometimes adversely affects solderability, take measures, such as removing air, into consideration.

6. Recommended pad pattern and size



Unit:mm

Case Size	a		b	c
	Solder Dipping	Reflow		
P	2.2	1.05	1.2	0.5
A	2.9	1.35	1.5	1.1
B	3	1.35	2.7	1.4
C	4.1	2	2.7	2.9
D	5.2	2.05	2.9	4.1

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