

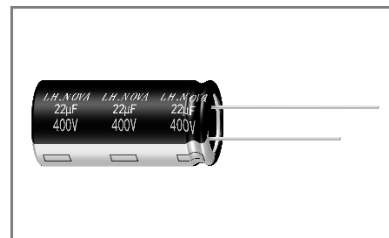
■RK 系列铝电解电容器

RK Series Aluminum Electrolytic Capacitor

◆特征

Feature

- * 寿命: 130℃ 2000 小时
Load life:130℃ 2000 hours.
- * 耐高温
High temperature.
- * 符合 RoHS
Compliant to the RoHS Directive.



◆应用

Application

- * 适用于高温应用下的各类开关电源等电子产品
Ideally suitable for various electronic products such as switching power supplies in high-temperature applications..

◆型号表示法

Part Number

8

680

VB

M

0511

RK

N

0

3

1

0

代码 Code	产品类别 Type
8	成品 Product

代码 Code	电压 Voltage
LB	10
LC	16
LD	25
VA	400
VE	420
VB	450

代码 Code	尺寸 Dimensions ΦDxL(mm)
0511	Φ5x11
AA12	Φ6.3x12
0812	Φ8x12
1020	Φ10x20
AB20	Φ12.5x20
1840	Φ18x40

代码 Code	商标 Trademark
N	LH.NOVA

代码 Code	内码 Internal Code
3	130℃

代码 Code	产品脚型 Lead Forming Type
0	散装品 Bulk
P	直脚方式编带品 original type(vertical) tape

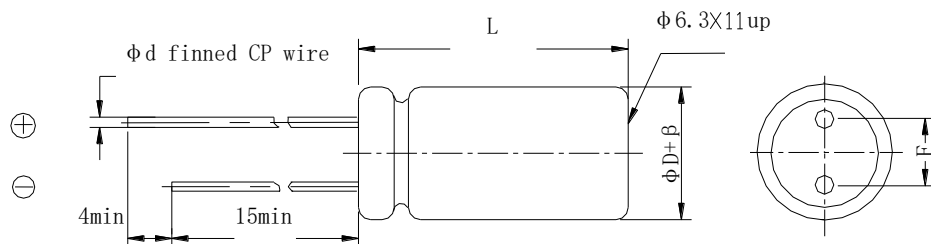
代码 Code	标称容量 Nominal Capacitance
1R0	1uF
680	68uF
501	500uF
472	4700uF

代码 Code	误差 Tolerance
K	±10%
V	± ²⁰ ₁₀ %
M	±20%
Q	± ³⁰ ₁₀ %

代码 Code	型号 Series
RK	RK

代码 Code	胶管颜色 Sleeve Color
0	黑色 Black
1	深蓝色 Deep-blue
7	棕色 Brown
9	绿色 Green

代码 Code	内码 Internal Code
1	普通品 regular
E	PET 胶管 平台胶粒
F	PET 胶管 凹台胶粒

◆产品结构
Product Structure


β(mm)	±0.5			±1.0				
ΦD(mm)	5	6.3	8	10	12.5	16	18	22
F±0.5(mm)	2.	2.5	3.5	5.0		7.5		10.0
Φd±0.1(mm)	0.5		0.6			0.8		
L(mm)	11,12		12,16	12,16,	16,20,25	16,20,25,30,35	20,25,30,35,40	25,30,35,40
	L±2.0							

◆主要特性表
Main specifications

项目 Item	主要特性 Performance Characteristics	
额定工作电压范围 Rated Voltage Range	10~100V.DC	160~450V.DC
使用温度范围 Operating Temperature Range	-40℃~+130℃	-25℃~+130℃
标称静电容量范围 Nominal Capacitance Range	1~4700 μF	2.2~220 μF
静电容量允许偏差 Capacitance Tolerance	$\pm 20\%$ (M, +20℃, 120Hz)	
漏电流 Leakage Current (20℃)	额定工作电压(V) Rated working voltage	10~100
	漏电流 Leakage current	2 分钟后 $I \leq 0.01CV$ 或 $3(\mu A)$, 取最大值 After 2 min. $I \leq 0.01CV$ or $3(\mu A)$, Whichever is greater.
C: 标称静电容量 (μF) Nominal Capacitance in μF		
V: 额定工作电压 (V) Rated working voltage in V		
损耗角正切 DF Dissipation Factor	额定工作电压(V) Rated working voltage	10 16 25 35 50 63 80~100 160~450
	DF(MAX) (20℃, 120Hz)	0.35 0.22 0.20 0.17 0.15 0.12 0.10 0.15
当容量值大于 1000 μF 时, 每增加 1000 μF , DF 值加 0.02		
For capacitance of more than 1000 μF , add 0.02 for every increase of 1000 μF .		

浪涌电压 Surge Voltage Test	额定工作电压(V) Rated working voltage		10	16	25	35	50	63	100	160	200	250	350	400	450
	浪涌电压(V) Surge voltage		13	20	32	44	63	79	125	200	250	300	400	450	500
	施加表中所列浪涌电压, 充电 30± 5 秒, 放电 5.5± 0.5 分钟作为一个周期, 共进行 1000 次。 测试温度: 15℃-35℃然后在标准大气条件下放置达到热稳定, 测试各参数。 Application of DC surge Voltage stated at table,1000 times of charging for 30 ± 5 sec.,discharging with a period of 5.5± 0.5 min.. Test temperature: 15℃ -35℃And the capacitor shall be stored under standard atmospheric conditions to obtain thermal stability, after which measurements shall be made.														
	容量变化: 在初始值的± 20%以内。损耗角正切值不大于规定值的 200%。漏电流: 不大于初始规定值 Capacitance change:Within ± 20% of the initial value Dissipation factor:Not more than 200% of the specified value.Leakage current: more than the initial specified value														
温度特性 Temperature Stability	额定工作电压(V) Rated working voltage				10	16	25	35	50	63	100	160~250	350~450		
	阻抗比(120Hz)		z-25℃/z+20℃		4	3	2	3	3	3	3	3	6		
	Impedance Ratio		z-40℃/z+20℃		6	6	4	3	3	3	3	3	--		
高温负荷特性 Load life	在+130℃ 环境中施加额定工作电压和最大允许纹波电流 2000 小时后,电容器的性能符合下面要求: After application of rated working voltage with max permissible ripple current specified at +130℃ for 2000hours, capacitors meet the characteristics requirements measured at +20℃ listed at below: 1、电容量变化率:±20%初始测量值以内 Capacitance change :±20% initial measured value 2、漏电流: ≤初始规定值 Leakage current: ≤initial specified value 3、损耗角正切值≤200%倍初始规定值 Dissipation factor: ≤200% initial specified value														
高温贮存特性 Shelf life	在+130℃环境无负荷放置 1000 小时后, 根据 JIS-C-5101-4, 加额定电压 30min,,常温放置 24~48 小时后测试, 电容器的性能符合下面要求: After leaving capacitors under no load at +130℃for 1000 hours, According to JIS-C-5101-4, apply the rated DC voltage for 30 minutes and store the capacitors under room temperature for 24-48 hours. The capacitors meet the characteristics listed as below: 1、电容量变化率:±20%初始测量值以内 Capacitance change : ±20% initial measured value 2、漏电流: ≤初始规定值 Leakage current: ≤initial specified value 3、损耗角正切值≤200%倍初始规定值 Dissipation factor: ≤200% initial specified value														

耐焊接热 Resistance to soldering heat	焊锡温度: $260 \pm 5^{\circ}\text{C}$, 浸入时间: 10 ± 1 秒, 浸入深度: 1.6mm Solderbath temperature: $260 \pm 5^{\circ}\text{C}$, Immersion time: $10 \pm 1\text{sec}$. Immersion depth: 1.6mm 外观: 无异状 Appearance: No remarkable abnormality 容量变化: 在初始值$\pm 10\%$范围内 Capacitance change: Within $\pm 10\%$ of the initial value. 损失角正切值: 不大于初始规定值 Dissipation factor: $\leq$ initial specified value 漏电流: 不大于初始规定值 Leakage current: $\leq$ initial specified value
稳态湿热 Resistance to damp heat (steady state)	试验温湿度: $40 \pm 2^{\circ}\text{C}$, 90~95%RH 试验时间: $500 \pm 10\text{h}$ 试验后, 电容器在标准大气条件下 2 小时, 然后测试参数 Test temperature and humidity: $40 \pm 2^{\circ}\text{C}$, 90~95%RH Test time: $500 \pm 10\text{h}$ After completion of test, the capacitor shall be subjected to standard atmospheric conditions for 2 hours, after which measurements shall be made. 外观: 无异状 Appearance: No remarkable abnormality 容量变化: 在初始值$\pm 10\%$范围内 Capacitance change: Within $\pm 10\%$ of the initial value. 损失角正切值: 不大于初始规定值 Dissipation factor: $\leq$ initial specified value 漏电流: 不大于初始规定值 Leakage current: $\leq$ initial specified value
防爆试验 Safety vent	以下试验只适用于铝壳直径$\geq \Phi 8$ 产品。 The following tests only apply to those products with vent products at diameter $\geq \Phi 8$ with vent. 在电容器两极施加反向直流电压, 其中通过的电流为 1A, 在测试时防爆装置应能在 30 分钟内动作。 DC Application test: The capacitor shall be subjected to a reverse DC voltage. The current flowing through the capacitor shall be 1A. If the vent does work with the voltage applied for 30 minutes, the test is considered to be passed. 应无引线、铝箔等散射, 无火花产生 The safety vent is actuated under the test conditions, thereby preventing terminals, metal pieces, etc, of the capacitor from scattering due to burst, the case from separating from the seal packing, or the capacitor from producing flame.

端子强度 Terminal strength	端子抗拉强度：沿电容器端子引线方向施加拉力(如下表)，10±1 秒。					
	引线直径 φ	0.45	0.50	0.60	0.80	1.00
	拉力 N	5	5	10	10	20
	Tensile strength of terminal: A static load shall be applied to the terminal in the axial direction and acting in a direction away from the body for 10±1 sec.					
	端子抗弯强度：在电容器引线施加固定重力（如下表），然后 5 秒内完成将电容体弯折 90° 后回到原位，再向相反方向弯折 90° 后回到原位。					
	引线直径 φ	0.45	0.50	0.60	0.80	1.00
	拉力 N	2.5	2.5	5	5	10
	Bending strength of terminal: Hang the specified dead weight, in about 5 sec then bend the body through 90°, return to the original position. Next bend it in opposite direction through 90° with the same speed, again return to the original position					
	外观：无可见机械损伤 Appearance: no visible mechanical damage 电容器应无接触不良开路或短路 The capacitor shall be no intermittent contacts, or open or short circuiting					
	振动试验 Resistance to vibration	在 3 个互相垂直的方向分别施加 2 小时振动，共 6 小时。				
频率：10-55Hz						
振幅峰-峰值：1.5mm.						
振速：1 分钟内振速 10~55~10Hz						
Direction and duration of vibration: 3 orthogonal directions mutually each for 2h , Total 6h.						
Vibration frequency range :10-55Hz.						
Peak to peak amplitude: 1.5mm						
Sweep rate :10 to 55 to 10Hz in about 1 min.						
外观：无可见机械损伤 Appearance: no visible mechanical damage 电容器应无接触不良开路或短路 The capacitor shall be no intermittent contacts, or open or short circuiting						

◆尺寸表、允许纹波、电流纹波电流频率因子

Dimensions and ripple current and frequency coefficient

纹波电流频率因子

Ripple current frequency coefficient

WV(V) \ Freq (Hz)	50 (60)	100 (120)	1K	10K	≥100K
6.3~100	0.20	0.40	0.70	0.80	1.00
160~450	0.25	0.50	0.80	0.90	1.00

尺寸表与允许纹波电流
Dimensions and ripple current

WV/V Cap/μF	10(LB)		16(LC)		25(LD)		35(LE)		50(LF)		63(LG)		100(MA)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
1									5×11	35	5×11	35	5×11	40
2.2									5×11	50	5×11	50	6.3×12	70
3.3									5×11	70	5×11	70	6.3×12	80
4.7									5×11	100	5×11	100	8×12	100
10									6.3×12	200	6.3×12	200	8×12	200
22									6.3×12	260	6.3×12	250	8×12	220
33									6.3×12	300	6.3×12	250	10×12	260
47									6.3×12	300	10×12	400	10×16	330
100							8×12	360	10×12	520	10×16	450	12.5×20	670
220					8×12	360	10×12	620	10×16 10×20	890	12.5×20	820	16×25	1100
330	8×12	360	8×12	360	10×12	620	10×16	800	12.5×20	1000	12.5×25	1000	16×30	1300
470	10×12	620	10×12	620	10×16	800	10×20	960	12.5×25	1200	16×25	1500	16×30 18×30	1600
1000	10×20	960	10×20	960	12.5×20	1100	12.5×25	1430	16×30	2180	16×30	1850		
2200	12.5×25	1430	12.5×25	1430	16×30	2300	16×35	2550	18×40	2800	18×40	2350		
3300	16×25	1900	16×30	2300	16×35	2550	18×35	2800						
4700	18×30	2300	16×35	2550										

(1) 外形尺寸 Case Size D×L(mm)

(2) 最大允许纹波电流 Max allowable ripple current (mA rms +130℃,100kHz)

WV/V Cap/μF	160(MB)		200(MC)		250(MD)		350(MF)		400(VA)		450(VB)	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
2.2									6.3×12	80	8×12	100
4.7									8×12 10×16	100 180	10×20	200
6.8							10×16	220	8×16 10×16	150 220	12.5×20	320
10	10×16	250	10×16	250	10×20	280	10×20	280	10×20 12.5×20	280 280	16×25 18×20	560
22	10×20	500	10×20	500	12.5×20	600	12.5×20	350	12.5×25 16×20	430	16×30 18×25	700
33	10×20	500	12.5×20	600	12.5×20	600	16×20	600	16×25 18×20	640	18×30	880
47	12.5×20	660	12.5×20	660	12.5×25 16×20	720	16×25 18×20	660	16×30 18×25	840		
68	12.5×25 16×20	760	12.5×25 16×20	760	16×25 18×20	920	16×30 18×25	850	18×30	1000		
100	16×25 18×20	1120	16×25 18×20	1120	16×30 18×25	1200						
150	16×30 18×25	1360	16×30 18×25	1360	18×30	1500						
220	16×30 18×25	1400	18×30	1700								

(1) 外形尺寸 Case Size D×L(mm)

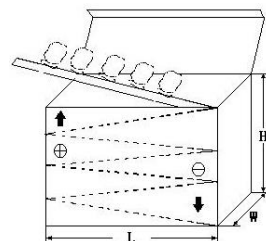
(2) 最大允许纹波电流 Max allowable ripple current (mA rms +130℃,100kHz)

◆包装

Packaging

* 编带产品包装规范与数量 Taped packaging quantity

直径 ΦD(mm)	数量(只) Qty. (Pcs)	L(电容高度)≤22mm L×W×H(mm)	L(电容高度)=25±2mm L×W×H(mm)
Φ5	2000	328×235×50	328×235×57
Φ6.3	1500		
Φ8	1000		
Φ10	600		
Φ12.5	400		
Φ16	250		
Φ18	200		



* 散装品包装数量 Bulk packaging quantity

直径 ΦD(mm) Diameter	高度 L(mm) Length	数量 (只/袋) Quantity (pcs/bag)	袋/盒 bag/box	内箱/外箱 Inner box/outer box	(只/箱) psc/box
Φ4	7-8	1000	15	4	60000
Φ5	5-7	1000	12	4	48000
Φ5	11	1000	10	4	40000
Φ6.3	5-7	1000	10	4	40000
Φ6.3	8-15	1000	8	4	32000
Φ6.3	15-20	1000	6	4	24000
Φ8	5-12	500	8	4	16000
Φ8	14-16	500	8	4	16000
Φ8	20	500	6	4	12000
Φ10	9-13	500	6	4	12000
Φ10	14-16	250	8	4	8000
Φ10	17-20	250	8	4	8000
Φ10	25-30	200	8	4	6400
Φ10	31-35	200	6	4	4800
Φ12-Φ13	16-28	200	6	4	4800
Φ12-Φ13	30-40	100	8	4	3200
Φ12-Φ13	45-55	100	6	4	2400
Φ16	15-20	100	8	4	3200
Φ16	21-30	100	6	4	2400
Φ16	31-40	50	10	4	2000
Φ18	15-20	100	6	2	1200
Φ18	25-30	50	8	2	800
Φ18	35-40	50	6	2	600
Φ18	41-50	25	10	2	500
Φ20	25-40	50	10	2	1000
Φ22	25-35	50	5	2	500
Φ22	≥40	25	10	2	500

◆贮存方法 Storage Methods

- * 请保管在室温 $5^{\circ}\text{C} \sim 35^{\circ}\text{C}$ ，湿度 75%RH 以下的环境
- * (1) 产品储存期限： ≤ 12 个月；Storage life: ≤ 12 months
- * (2) 产品储存期限超 12 个月时，需充电后再使用
- * (3) 产品储存时间超过 3 年的应报废处理
- * (4) 库存有效期以套管上印刷的时间开始计算
- * (5) 请尽量以包装状态保管
- * (6) 当电容器长期储存后，漏电流会升高，温度越高，漏电流上升越快，因此应注意储存环境。如铝电解电容器的漏电流上升对电路有不良影响，请在使用前充电处理
- * (7) 请避免在以下环境中保管
 - ① 溅水、高温高湿及结露的环境；
 - ② 溅油、或者充满气体油成分的环境；
 - ③ 充满酸性有毒气体（硫化氢、亚硫酸、亚硝酸、氯、溴、溴化甲烷等）的环境；
- * We recommend the following conditions for storage: Ambient temperature: $5^{\circ}\text{C} \sim 35^{\circ}\text{C}$, Ambient humidity: Less than 75% RH.
- * (1) Storage life: ≤ 12 months;
- * (2) If storage life time is over 12 months, the products need to be recharged;
- * (3) If storage life time is over three years, the product need to be discarded;
- * (4) Expiry date: calculating from the date marked on the sleeve;
- * (5) Please keep capacitors in the original package;
- * (6) Leakage current tends to increase when capacitors have been stored for long period of time. The higher temperature, the faster leakage current rises. Please take caution when selecting the storage location. The leakage current decreases gradually as voltage is applied to the capacitor. If the rising leakage current may cause problems in the circuit, please charge the capacitor before using.
- * (7) Avoid storing the capacitors under such circumstances:
 - ① Environment of water splashing, high temperature, high humidity and dewing;
 - ② The environment that splashes oil, or is filled with gas oil;
 - ③ With full of acid toxic gases environment such as (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, bromine, methyl bromide, etc.

◆铝电解电容器使用注意事项

Important information on the application of aluminum electrolytic capacitors

- * (1) 直流铝电解电容器应按正确的极性使用
当直流铝电解电容器被反极性接入电路时，电容器会导致电子线路短路，由此产生的电流会引致电容器损坏。若电路中有可能会在负引线施加正极电压，请选用无极性产品
- * (2) 在额定工作电压以下作用
当电容器上所施加电压高于额定工作电压时，电容器的漏电流将上升，其电气特性将在短时间内劣化直至损坏。注意电压峰值请勿超出额定工作电压
- * (3) 常规产品禁止作快速充放电使用

当常规电容器被用作快速充电用途。其使用寿命可能会因为容量下降，温度急剧上升等而缩减。

* (4)施加纹波电流应小于额定值

施加纹波电流超过额定值后，会导致电容器体过热，容量下降，寿命缩短。所施加纹波电压的峰值应小于额定工作电压。

* (5)使用环境温度

铝电解电容器的使用寿命会受到环境温度的影响。据科学统计，使用环境温度下降 10℃ 其使用寿命增加 1 倍。

* (6)引出线强度

当拉力施加到电容器引出线，该拉力将作用于电容器内部，这将导致电容器内部短路，开路或漏电流上升。在电容器焊装到电路板，请勿强烈摇动电容器。

* (7)焊接过程耐热性

铝电解电容器装至电路板进行浸焊或波峰焊时，其塑料套管可能因焊接时间过长、温度过高而发生破裂或二次收缩。

* (8)电路板的安装孔距及安装位置

电路板安装孔的设计应与产品说明书的引线脚距一致，如果将电容器强行插入孔距不配套的电路板，那么会有应力作用于引出线，这将导致短路或漏电流上升。

* (9)铝电解电容可能会有残留电压，请在使用前对电容器进行放电。

(1) DC aluminum electrolytic capacitors should be used according to the correct polarity

When a DC aluminum electrolytic capacitor is connected to a circuit with reverse polarity, the capacitor will cause a short circuit in the electronic circuit, and the resulting current will cause damage to the capacitor. If it is possible to apply positive voltage to the negative lead in the circuit, please choose a non-polar product.

(2) Function below rated operating voltage

When capacitor is used at higher voltage than the rated voltage, leakage current increases, characteristics drastically deteriorate and damage in a short period may occur as a result. Please take extra caution that the peak voltage should not exceed the rated voltage.

(3) Conventional capacitors are prohibited from being used for fast charging and discharging

When aluminum electrolytic capacitors for general purpose are employed in rapid charge and discharge application, its life may be shorted by capacitance decreasing, heat rising, etc.

(4) The applied ripple current should be less than the rated value

Excessive heat will reduce capacitance and result in shortened life of capacitor if ripple currents exceeding the specified rated value are applied. The peak value of the ripple voltage should be less than the rated voltage.

(5) Operating ambient temperature

Its ambient temperature closely affects the life of an aluminum electrolytic capacitor. It is generally stated, that life doubles for each 10℃ decrease in temperature.

(6) Terminal Strength

When a strong force is applied to the lead wires or terminals, stress is put on the internal connections. This may result in short circuit, open circuit or increased leakage current. It is not advisable to bend or handle a capacitor after it has been soldered to the PCB board.

(7) Heat resistance during welding process

In the dip soldering process of PCB board with aluminum electrolytic capacitors mounted, secondary shrinkage or crack of PVC sleeve may be observed when solder temperature is too high or dipping time is too long.

(8) Installation pitch-row and installation position of circuit boards

PCB board must be designed so its hole coincides with the lead pitch (lead spacing) of the capacitor specified by the catalog or specifications. When a capacitor is forcibly inserted into an unmatched hole, a stress is put on the leads. This could result in a short circuit or increased leakage current.

(9) Aluminum electrolytic capacitors may have residual voltage, please discharge the capacitor before use.

◆ **推荐安装/焊接方法 Recommended Installation/Welding Methods**

*波峰焊接条件

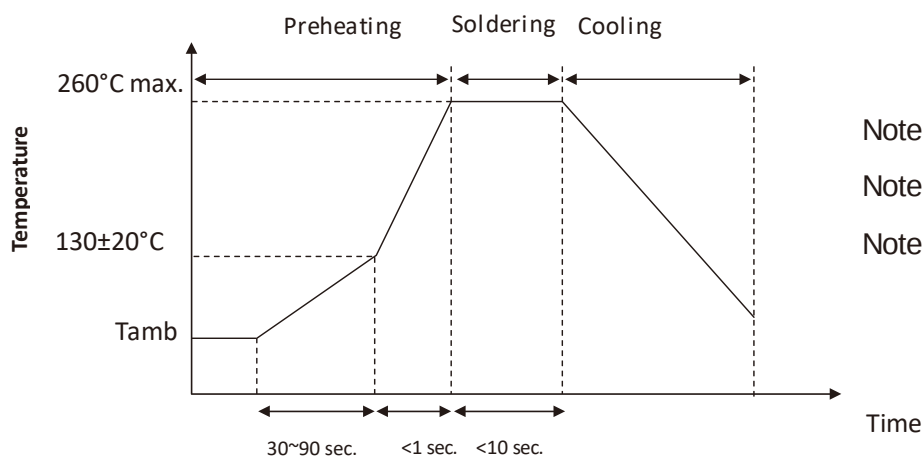
预热：105°C

波峰焊：260±5°C 10±1 秒以下（或 380±10°C 3±0.5 秒以下：手焊）

*Wave Soldering Conditions

Preheating: 105°C

Wave Soldering: 260±5°C for ≤10±1 seconds (or 380±10°C for ≤3±0.5 seconds for manual soldering)



◆ **其它说明 OTHERS**

*本产品不含铅、镉等元素

This product does not include Plumbum or Cadmium.

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