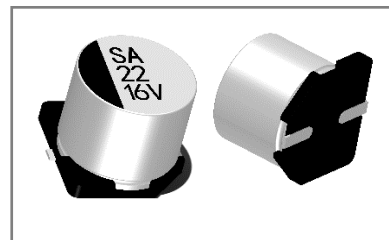


## ■ MA 系列铝电解电容器

### MA Series Aluminum Electrolytic Capacitor

#### ◆特征 Features

- \* 寿命: 105℃ 1000 小时  
Load life: 105℃ 1000 hours.
- \* 高频超低阻抗  
Ultra low impedance value at high frequency
- \* 符合 RoHS  
Compliant to the RoHS Directive.

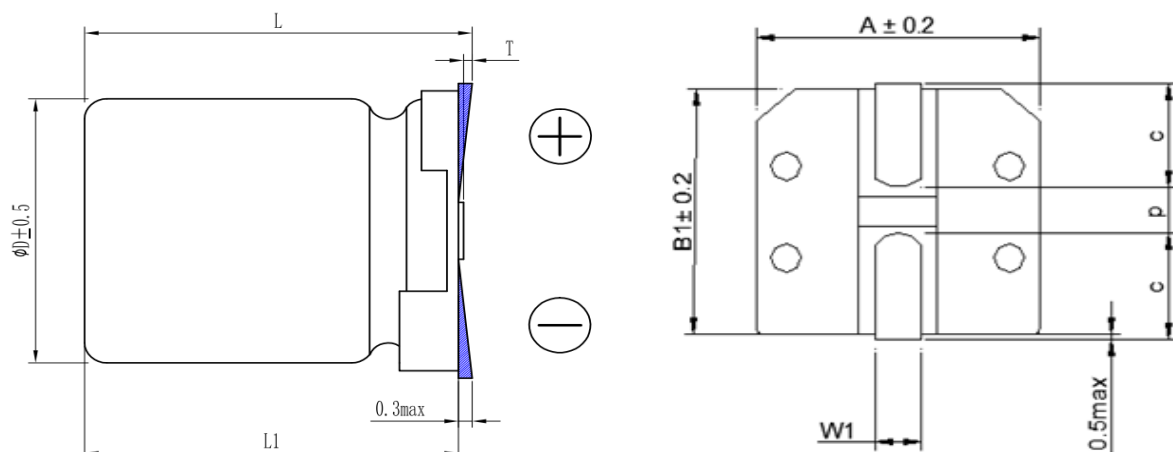


#### ◆应用 Application

- \* 适用于开关电源、通信设备及其它各种电子产品  
Ideally suited for switching power supplies, telecommunication and other electronic products.
- \* 适用于自动表面贴装技术和高密度电路  
Ideally suited for automatic SMT and high density circuits.

#### ◆型号表示法 Part Number

8	331	LF	M	0405	MA	0	0	0	1	T																																															
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**◆产品结构 Product Structure**


$\phi D \pm 0.5$	L	$A \pm 0.2$	$B_1$	$C \pm 0.2$	$W_1$	$P \pm 0.2$
4	$5.5 \pm 0.2$	4.3	4.3	1.8	0.5~0.8	1.0
5	$5.5 \pm 0.2$	5.3	5.3	2.1	0.5~0.8	1.4
6.3	$5.5 \pm 0.2$	6.6	6.6	2.5	0.5~0.8	2.0
6.3	$7.7 \pm 0.3$	6.6	6.6	2.5	0.5~0.8	2.0
8	$10.5 \pm 0.5$	8.5	8.5	2.9	0.8~1.1	3.1
10	$10.5 \pm 0.5$	10.3	10.3	3.2	0.8~1.1	4.5

**◆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	6.3~50V.DC	
使用温度范围 Operating Temperature Range	$-55^{\circ}\text{C} \sim +105^{\circ}\text{C}$	
标称静电容量范围 Nominal Capacitance Range	4.7~330 $\mu\text{F}$	
静电容量允许偏差 Capacitance Tolerance	$\pm 20\%$ (M, $+20^{\circ}\text{C}$ , 120Hz)	
漏电流 Leakage Current ( $20^{\circ}\text{C}$ )	额定工作电压(V) Rated working voltage	6.3~50
	漏电流 Leakage current	2 分钟后 $I \leq 0.01CV$ 或 $3(\mu\text{A})$ , 取较大值 After 2 min. $I \leq 0.01CV$ or $3(\mu\text{A})$ , Whichever is greater.
C: 标称静电容量 ( $\mu\text{F}$ ) Nominal Capacitance in $\mu\text{F}$ V: 额定工作电压 (V) Rated working voltage in V		
损耗角正切值 Dissipation Factor	额定工作电压(V) Rated working voltage	6.3    10    16    25    35~50
	DF(MAX) ( $20^{\circ}\text{C}$ , 120Hz)	0.22    0.19    0.16    0.14    0.12

耐浪涌电压 Surge Voltage	<table><tr><td>额定工作电压(V) Rated working voltage</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>浪涌电压 Surge voltage (V)</td><td>8</td><td>13</td><td>20</td><td>32</td><td>44</td><td>63</td></tr></table>							额定工作电压(V) Rated working voltage	6.3	10	16	25	35	50	浪涌电压 Surge voltage (V)	8	13	20	32	44	63																												
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	<p>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。</p> <p>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.</p>																																																
	<p>容量变化：在初始值的±15%以内。</p> <p>Capacitance change: Within ± 15% of the initial value</p> <p>损耗角正切值不大于规定值。</p> <p>Dissipation factor: Not more than the specified value.</p> <p>漏电流：不大于规定值。</p> <p>Leakage current: Not more than the specified value</p>																																																
温度特性 Temperature Characteristic	<p>电容器根据下表的次序处理，放置在每一温度下，待阻抗或电容量稳定后方可测试。</p> <p>The capacitor shall be subjected in turn to the procedures specified below. The capacitor should be stored at each temperature until measured impedance or capacitance are stabilized.</p>																																																
	<table><tr><td>阶段 Step</td><td>温度 Temperature</td><td colspan="5">时间 Time</td></tr><tr><td>1</td><td>20±2℃</td><td colspan="5">热平衡状态 Thermal balance</td></tr><tr><td>2</td><td>下限类别温度 Lower temperature</td><td colspan="5">2 hours</td></tr><tr><td>3</td><td>20±2℃</td><td colspan="5">热平衡状态 Thermal balance</td></tr><tr><td>4</td><td>105±2℃</td><td colspan="5">2 hours</td></tr><tr><td>5</td><td>20±2℃</td><td colspan="5">热平衡状态 Thermal balance</td></tr></table>							阶段 Step	温度 Temperature	时间 Time					1	20±2℃	热平衡状态 Thermal balance					2	下限类别温度 Lower temperature	2 hours					3	20±2℃	热平衡状态 Thermal balance					4	105±2℃	2 hours					5	20±2℃	热平衡状态 Thermal balance				
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<p>阶段 1：测定容量，损耗和阻抗值。</p> <p>Step 1: Capacitance, Dissipation Factor and impedance shall be measured.</p> <p>阶段 2：放置 2 小时后，达到热平衡状态再测定容量，损耗和阻抗值。</p> <p>Step 2: After the capacitor being stored for 2 hours, Capacitance, Dissipation Factor and impedance shall be Measured. The measurement shall be made at thermal stability.</p> <p>阶段 4：放置 2 小时后，达到热平衡状态再测定容量，损耗和阻抗值。</p> <p>Step 4: After the capacitor being stored for 2 hours, Capacitance, Dissipation Factor and impedance shall be Measured. The measurement shall be made at thermal stability.</p>																																																	
<p>阻抗比（阶段 2 对阶段 1）Impedance ratio</p>																																																	
<table><tr><td colspan="2">额定工作电压(V) Rated working voltage</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35~50</td></tr><tr><td>阻 抗 比 (120Hz)</td><td>z-25℃/z+20℃</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Impedance Ratio</td><td>z-55℃/z+20℃</td><td>5</td><td>4</td><td>4</td><td>3</td><td>3</td></tr></table>							额定工作电压(V) Rated working voltage		6.3	10	16	25	35~50	阻 抗 比 (120Hz)	z-25℃/z+20℃	3	2	2	2	2	Impedance Ratio	z-55℃/z+20℃	5	4	4	3	3																						
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<p>静电容量变化率（阶段 4 对阶段 1）：阶段 1 的±20%</p> <p>Capacitance change: within ±20% of step 1</p> <p>漏电流（阶段 4）：规定值 5 倍以下</p> <p>Leakage Current: Less than 500% of the specified value.</p>																																																	

<p>高温负荷特性 Load life</p>	<p>试验温度: <math>105\pm 2^{\circ}\text{C}</math>, 施加额定电压和额定纹波电流            试验时间: 1000 小时            Test temperature: <math>105\pm 2^{\circ}\text{C}</math>, Application of the rated voltage and the rated ripple current.            Test time: 1000h</p> <p>外观: 无异状            Appearance: No remarkable abnormality            容量变化: 在初始值<math>\pm 30\%</math>范围内            Capacitance change: Within <math>\pm 30\%</math> of the initial value.            损耗角正切值: <math>\leq 300\%</math> 规定值            Dissipation factor: <math>\leq 300\%</math> of the specified value            漏电流: 不大于规定值            Leakage current: <math>\leq</math> specified value</p>
<p>高温贮存特性 Shelf life</p>	<p>试验温度: <math>105\pm 2^{\circ}\text{C}</math> 环境下无负荷贮存            试验时间: 1000 小时            Test temperature: without voltage load at <math>105\pm 2^{\circ}\text{C}</math>            Test time: 1000h</p> <p>外观: 无异状            Appearance: No remarkable abnormality            容量变化: 在初始值<math>\pm 25\%</math>范围内            Capacitance change: Within <math>\pm 25\%</math> of the initial value.            损耗角正切值: <math>\leq 200\%</math> 规定值            Dissipation factor: <math>\leq 200\%</math> of the specified value            漏电流: <math>\leq 200\%</math> 规定值            Leakage current: <math>\leq 200\%</math> of the specified value</p>
<p>温度快速变化 Rapid Temperature Changes</p>	<p>试验温度: 高温: 上限类别温度、低温: 下限类别温度; 高低温暴露时间: 各 30 分钟;            循环次数: 5 次; 试验结束后恢复时间不少于 16 小时。            Expose to the upper and lower category temperatures for 30 minutes each, with a transition time of less than 1 minute between high and low temperatures, and cycle 5 times. The recovery time shall be not less than 16 hours after the end of the experiment.</p> <p>外观: 无可见损伤和电解质漏出            Appearance: No remarkable damage and electrolyte leakage            容量变化: 在初始值<math>\pm 20\%</math>范围内            Capacitance change: Within <math>\pm 20\%</math> of the initial value.            损耗角正切值: <math>\leq 200\%</math> 规定值            Dissipation factor: <math>\leq 200\%</math> of the specified value            漏电流: <math>\leq 200\%</math> 规定值            Leakage current: <math>\leq 200\%</math> of the specified value</p>

耐焊接热  
Resistance To Soldering Heat

回流焊温度曲线  
Return to normal temperature and measure it after reflow in the condition

额定电压 V Rated Voltage	4~50	4~50	≥63	4~100	≥160		
尺寸 φ Dimension φ	4~6.3	4~6.3	4~6.3	8~10	≥12.5		
温度 T1~T2 Temperature T1~T2	150~180						
时间 t1, s Time t1, s	120	100					
温度 T3 Temperature T3	230	217	230	217	217	230	217
时间 t2, s Time t2, s	30	90	60	60	60	40	40
温度 T4 Temperature T4	250	260		250	250		240
时间 t3, s Time t3, s	5						
回流次数 Reflow Times	1	≤2					

1) 电容表面温度不超过 T4(°C)

2) 电容器表面温度超过 200°C和 230°C的时间分别不得超过 t2 秒。

3) 预热应在 100°C~200°C之间进行, 最长时间为 180 秒

1) Temperature at surface of capacitor shall not exceed T4(°C).

2) Period that temperature at surface of capacitor becomes more than 200°C and 230°C shall not exceed t2.

3)Preheat shall be made at 100°C~200°C and for maximum 180 seconds.

外观: 无异状

	<p>Appearance: No remarkable abnormality</p> <p>容量变化: 在初始值<math>\pm 5\%</math>范围内</p> <p>Capacitance change: Within <math>\pm 5\%</math> of the initial value.</p> <p>损耗角正切值: 不大于规定值的 2 倍</p> <p>Dissipation factor: <math>\leq 200\%</math> of the specified value</p> <p>漏电流: 不大于规定值</p> <p>Leakage current: <math>\leq</math> specified value</p>
<p>稳态湿热</p> <p>Resistance To Damp Heat</p> <p>(Steady State)</p>	<p>试验温湿度: <math>40\pm 2^{\circ}\text{C}</math>, 90~95%RH</p> <p>试验时间: <math>500\pm 10</math> 小时</p> <p>试验后, 电容器在标准大气条件下 2 小时, 然后测试参数</p> <p>Test temperature and humidity: <math>40\pm 2^{\circ}\text{C}</math>, 90~95%RH</p> <p>Test time: <math>500\pm 10\text{h}</math></p> <p>After completion of test, the capacitor shall be subjected to standard atmospheric conditions for 2 hours, after which measurements shall be made.</p> <p>外观: 无异状</p> <p>Appearance: No remarkable abnormality</p> <p>容量变化: 在初始值<math>\pm 10\%</math>范围内</p> <p>Capacitance change: Within <math>\pm 10\%</math> of the initial value.</p> <p>损耗角正切值: <math>\leq 200\%</math>规定值</p> <p>Dissipation factor: <math>\leq 200\%</math> of the specified value</p> <p>漏电流: <math>\leq 200\%</math>规定值</p> <p>Leakage current: <math>\leq 200\%</math> of the specified value</p>
<p>端子强度</p> <p>Terminal Strength</p>	<p>将组件安装在带有待测试设备的 PCB 上, 向待测试设备侧面施加 17.7 N (1.8 Kg) 的力。应施加此力 60+1 秒。此外, 应逐渐施加力, 以免对被测部件造成冲击。</p> <p>With the component mounted on a PCB with the device to be tested, apply a 17.7 N (1.8 Kg) force to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to apply a shock to the component being tested.</p> <p>外观: 无可见机械损伤</p> <p>Appearance: no visible mechanical damage</p> <p>电容器应无接触不良开路或短路</p> <p>The capacitor shall be no intermittent contacts, or open or short circuiting</p>

<p style="text-align: center;">耐溶剂性 Solvent Resistance</p>	<p>三种溶剂：</p> <p>溶剂 a、在 20℃~30℃按下述配方构成混合溶剂：1）一份体积的分析纯异丙醇；2）三份体积的 80%体积的煤油和 20%体积的乙苯构成的混合液；</p> <p>溶剂 b、三氯三氟乙烷，半水溶性的溶剂；</p> <p>溶剂 c、在 63℃~70℃，按下述配方构成混合溶剂：1）42 份体积的去离子水；2）一份体积的乙二醇-丁醚；3）一份体积的单乙醇胺；</p> <p>将样品分成 3 组，分别浸在 a、b、c 三种溶剂 3min 后擦拭 10 次；擦拭后，立即按上述方法再重复 2 回，浸、刷共 3 回。然后用水洗清洗剂进行清洗，并在室温下对整个表面进行通风干燥。</p> <p>The solvent solutions used in this test shall consist of the following:</p> <p>Solvent a: A mixture consisting of the following at 20℃~30℃:</p> <p>1) One part by volume of isopropyl alcohol.</p> <p>2) Three parts by volume of a mixture of 80% by volume of kerosene and 20% by volume ethyl benzene.</p> <p>Solvent b: Trichlorotrifluoroethane, semi water-soluble solvents.</p> <p>Solvent c: A mixture consisting of the following at 63℃~70℃:</p> <p>1) Forty-two parts by volume of deionized water.</p> <p>2) One part by volume of ethylene glycol butyl ether.</p> <p>3) One part by volume of monoethanolamine.</p> <p>The specimens subjected to this test shall be divided into three groups of approximately equal size, were immersed in a, b, c three solvents solutions. The specimens shall be completely immersed for 3 minutes, immediately following immersing, each specimen shall be tested as follows: The bristle portion of the brush, shall be dipped in the solution until wetted and the specimen shall be brushed with normal hand pressure (approximately 2 to 3 ounce applied normal to the surface) for ten strokes on the portion of the specimen where has been applied. The brush stroke shall be directed in a forward direction across the surface of the specimen being tested. Immediately after brushing, the procedure shall be repeated two more times, for a total of three immersions, followed by brushing. After completion of the third immersion and brushing, the specimens shall be rinsed in approximately 25℃ water and all surfaces sir-blown dry.</p> <p>外观：无异状</p> <p>Appearance: No remarkable abnormality</p> <p>容量变化：在初始值±3%范围内</p> <p>Capacitance change: Within ±3% of the initial value.</p> <p>损耗角正切值：不大于规定值</p> <p>Dissipation factor: ≤ specified value</p> <p>漏电流：不大于规定值</p> <p>Leakage current: ≤ specified value</p>
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<p>可焊性 Solderability</p>	<p>焊锡温度: 235±5℃, 浸入时间: (2±0.5)秒, 浸入和提出速率: (25±6)毫米/秒 Solder Temperature: 235±5℃, Solder Immersion Time:(2±0.5) sec. Solder Immersion / Emersion Rate: (25±6) mm/sec.</p> <p>浸入焊锡的引线表面积约 95%以上应附着新锡。 At least 95% of circumferential surface of the dipping portion of terminal shall be covered with new solder.</p>
<p>振动试验 Resistance To Vibration</p>	<p>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: 0.75 毫米。 Apply vibration in three mutually perpendicular directions for 2 hours each, for a total of 6 hours Vibration frequency range: 10-55Hz Amplitude: 0.75mm</p> <p>外观: 无可见机械损伤 Appearance: No visible mechanical damage 容量变化: 在初始值±5%范围内 Capacitance change: Within ±5% of the initial value. 损耗角正切值: 不大于规定值 Dissipation factor: ≤ specified value 漏电流: 不大于规定值 Leakage current: ≤ specified value</p>
<p>机械冲击 Mechanical Shock</p>	<p>脉冲波形: 正半弦波; 峰值加速度: 100g; 脉冲持续时间: 6ms; 三个轴六个向各 3 次, 共 18 次, 电容器的性能符合下面要求: Waveform: Half-sine, Peak value: 100g, Nomal duration: 6ms Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen (18 shocks). Capacitors meet the characteristics listed as below.</p> <p>外观: 无可见机械损伤 Appearance: No visible mechanical damage 电容量变化率: ±5%初始测量值以内 Capacitance change: Within ±5% of the initial value. 损耗角正切值≤规定值 Dissipation factor: ≤ specified value 漏电流: ≤规定值 Leakage current:≤ specified value</p>

### ◆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

<div> <div>Freq (Hz)</div> <div>Cap (μF)</div> </div>	50 (60)	100 (120)	1K	10K	≥100K
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4.7	0.30	0.42	0.60	0.80	1.00
10~47	0.45	0.55	0.75	0.90	1.00
330	0.65	0.70	0.85	0.95	1.00

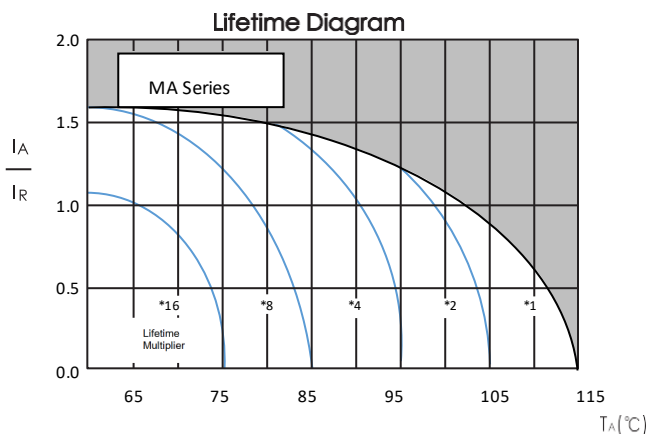
\*尺寸表与允许纹波电流

Dimensions and ripple current

Rated voltage	Rated capacitance	Case size	ESR( $\Omega$ )	Rated ripple current
额定电压	标称容量(uF)	尺寸 $\Phi D \times L$ (mm)	等效串联电阻	额定纹波电流
			at 20°C ,100 KHz	(mA rms/105°C/100kHz)
6.3	47	5×5.5	0.76	150
	100	6.3×5.5	0.44	230
	220	6.3×5.5	0.36	240
	330	6.3×7.7	0.26	300
10	22	4×5.5	1.80	80
	33	5×5.5	0.76	150
	47	6.3×5.5	0.44	230
	100	6.3×5.5	0.44	230
	220	6.3×5.5	0.26	300
	330	6.3×7.7	0.16	600
16	22	5×5.5	0.76	150
	33	6.3×5.5	0.44	230
	47	6.3×5.5	0.44	230
	100	6.3×5.5	0.44	230
	220	6.3×5.5	0.26	300
	330	6.3×7.7	0.16	600
25	4.7	4×5.5	1.80	80
	10	5×5.5	0.76	150
	22	6.3×5.5	0.44	230
	33	6.3×5.5	0.44	230
	47	6.3×5.5	0.44	230
	100	6.3×7.7	0.26	300
	220	6.3×7.7	0.16	600
	330	8×10.5	0.08	900
35	4.7	4×5.5	1.70	85
	10	5×5.5	0.70	140
	22	6.3×5.5	0.40	235
	33	6.3×5.5	0.40	240
	47	6.3×5.5	0.38	300
	100	6.3×5.5	0.25	320
	220	6.3×7.7	0.14	610

Rated voltage	Rated capacitance	Case size	ESR( $\Omega$ )	Rated ripple current
额定电压	标称容量(uF)	尺寸 $\Phi D \times L$ (mm)	等效串联电阻	额定纹波电流
			at 20°C ,100 KHz	(mA rms/105°C/100kHz)
	330	8×10.5	0.08	910
50	4.7	4×5.5	1.80	80
	10	5×5.5	0.76	150
	22	6.3×5.5	0.76	150
	33	6.3×5.5	0.44	230
	47	6.3×7.7	0.44	260
	100	8×10.5	0.44	300
	220	8×10.5	0.16	670
	330	10×10.5	0.12	900

### ◆产品特征曲线 Product Characteristic Curve



$I_A$  = 120Hz 时的实际纹波电流,  $I_R$  = 120Hz 时的额定纹波电流, 105°C

使用寿命系数与环境温度和纹波电流负载的函数关系。

### ◆包装 Packaging

#### \* 包装标签内容 Package label content

- |              |                       |            |                                |
|--------------|-----------------------|------------|--------------------------------|
| 1) 客户物料号 P/N | Customer Material P/N | 6) 容量偏差    | Tolerance on Rated Capacitance |
| 2) 风华物料号 P/N | FENGHUA Material P/N  | 7) 规格尺寸    | Specification                  |
| 3) 批号        | Lot number            | 8) 日期      | Date                           |
| 4) 数量        | Quantity              | 9) RoHS 标识 | RoHS                           |
| 5) 系列        | Series                | 10) 二维码    | QR code                        |

其中批号的填写 Lot number

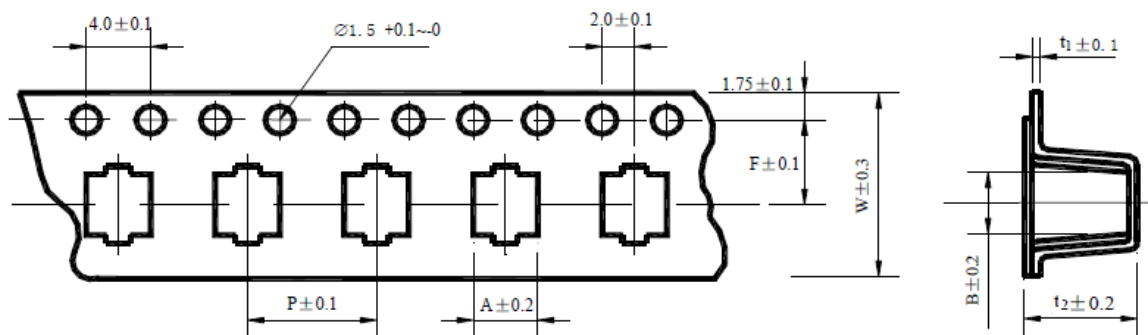
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类别 年份 月份 日期 区别号  
 Sort Year Month Date Discriminate mark

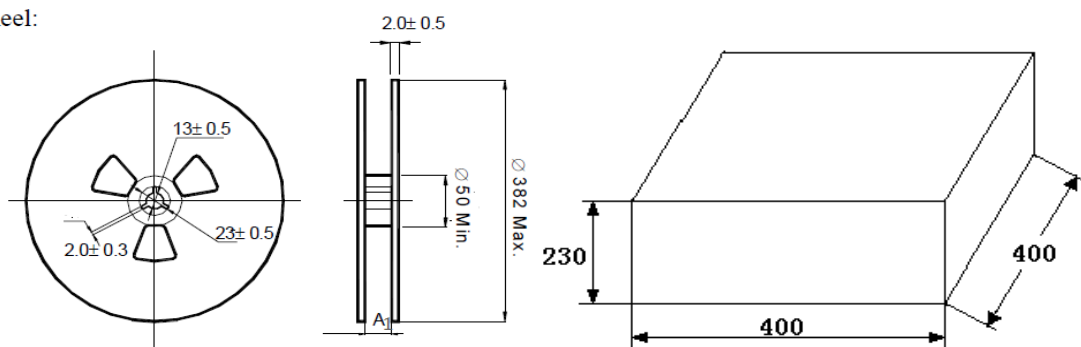
流传单号码  
 Sequence number

\* 编带产品按下图包装方式

Taped capacitors are packed into carton, according to the following drawing



Reel:



系列 Series	尺寸 Size	W	A	B	P	t <sub>2</sub>	F	t <sub>1</sub>
MA	Φ4×5.5	12.0	4.7	4.7	8	5.7	5.5	0.4
	Φ5×5.5	12.0	5.7	5.7	12	5.7	5.5	0.4
	Φ6.3×5.5	16.0	7.0	7.0	12	5.7	7.5	0.4
	Φ6.3×7.7	16.0	7.0	7.0	12	8.3	7.5	0.4
	Φ8×10.5	24.0	8.7	8.7	16	11	11.5	0.4
	Φ10×10.5	24.0	10.7	10.7	16	11.0	11.5	0.4

垂直安装 Vertical Mount		
尺寸 Size	A <sub>1</sub>	数量 Quantity/reel
Φ4×5.5	14	2000pcs
Φ5×5.5	14	1000pcs
Φ6.3×5.5	18	1000pcs
Φ6.3×7.7	18	1000pcs
Φ8×10.5	26	500pcs
Φ10×10.5	26	500pcs

### ◆贮存方法 Storage Methods

- \* 请保管在室温 5℃~35℃，湿度 75%RH 以下的环境
- \* (1)产品储存期限：≤12 个月；
- \* (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)避免在下列环境中保管

- 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℃~35℃, 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 products need to be discarded;

\* (4) Expiry date: calculating from the date marked on the sleeve;

\* (5) Please keep capacitors in the original package;

\* (6) Avoid storing the capacitors under such circumstances:

- ①Environment of water splashing, high temperature, high humidity and dewing;
- ②The environment that splashes oil, or is filled with gas oil;
- ③With 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下劣化直至损坏。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°C 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.

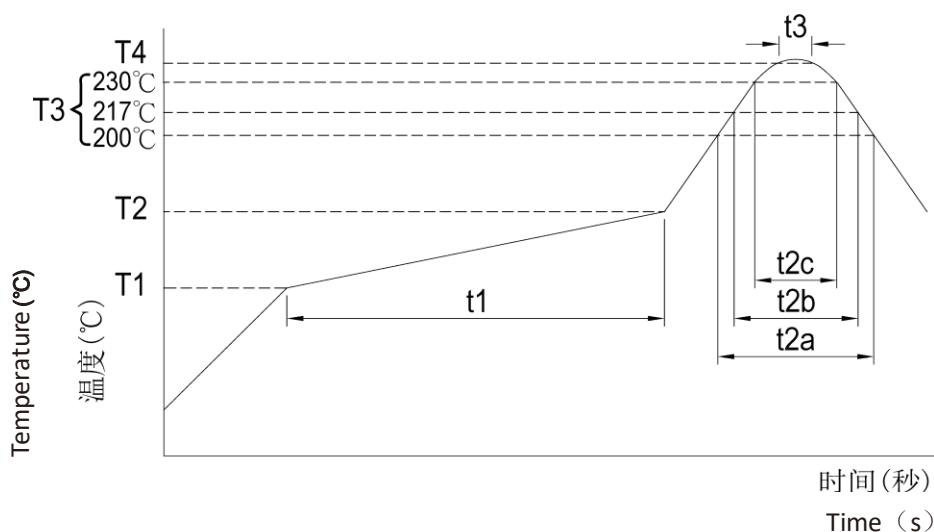
(9) Aluminum electrolytic capacitors may have residual voltage, please discharge the capacitor before use.

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

\* (1) 焊接方法之适用性 Applicability of Soldering Methods

焊接方法 Soldering Method	回流焊 Reflow Soldering	铬铁 Soldering Iron	波峰焊 Wave Soldering
可行性 Feasibility	可行 Feasible	可行 Feasible	不可行 Not Feasible

\* (2) 无铅回流焊使用条件 Operating Conditions for Lead-Free Reflow Soldering



\* (3) 测试条件 Test Conditions

制品别 Product Category		非固态电容器 Non-Solid Capacitor						高分子固态电 容器 Polymer Solid Capacitor	高分子固液混 合电容器 Polymer Solid-Liquid Hybrid Capacitor			
额定电压(V) Rated Voltage (V)		4 ~ 50	4 ~ 50	≥ 63	4 ~ 100	≥ 160		---	---			
制品尺寸(φ) Product Dimension (φ)		4 ~ 6.3φ × 4.5L	4 ~ 6.3	4 ~ 6.3	8 ~ 18	≥ 12.5		---	---			
预热 Preheating	温度 (T1 ~ T2, °C) Temperature (T1 ~ T2, °C)	150 ~ 180						150 ~ 200	150 ~ 180			
	时间(t1) (最大, 秒) Time (t1) (Max, s)	120	180						180	120		
持续时间 Soaking Period	温度 (T3, °C) Temperature (T3, °C)	230	217	230	217	217	230	217	230	200	217	280
	时间(t2) (最大, 秒) Time (t2) (Max, s)	t2c	t2b	t2c	t2b	t2b	t2c	t2b	t2c	t2a	t2b	t2c
		30	90	60	60	60	30	90	70	60	70	40

最高温度 Peak Temperature	温度 (T4, °C) Temperature (T4, °C)	250	260*	250	250	240	250	260	250	260
	时间 (t3, 秒) Time (t3, s)	5					5		5	
回流次数 Reflow Times		1	≤ 2				2	1	2	1

- ① 如使用条件较上表所列为高时，请与我们联系。
- ② 在执行第 2 次回流焊时，请确认电容器之温度已冷却至 5 ~ 35°C。
- ① If the operating conditions exceed those listed in the above table, please contact us.
- ② When performing the second reflow soldering, please confirm that the capacitor has cooled down to 5 ~ 35°C.

\* (4) OP-CAP 回流焊注意事项

回流焊会降低制品额定静电容量，应确认回流焊条件是否满足建议回流焊之规范。

虽然实际的回流焊条件变更仍依据回各项回流焊焊接方法，请注意制品铝壳底部之最高温度及电极端子不可超过最高温度。

请特别注意：OP-CAP 制品在回流焊加热过程之温度应提高至 200°C 以上。

若回流焊条件(温度或持续时间)大于上表所列，则 OP-CAP 制品会受损：制品静电容量降低约 50%、漏电流变大(上升至数毫安/mA)，以及损坏电容器外部。

(4) OP-CAP Reflow Soldering Precautions

Reflow soldering will reduce the rated capacitance of the product. It is necessary to confirm whether the reflow soldering conditions comply with the recommended specifications.

Although changes to actual reflow soldering conditions shall still be based on the respective reflow soldering methods, please note that the maximum temperature at the bottom of the product's aluminum case and the electrode terminals must not exceed the specified maximum temperature.

Important Note: The temperature of OP-CAP products during the reflow soldering heating process shall be raised to above 200°C.

If the reflow soldering conditions (temperature or duration) exceed those listed in the above table, OP-CAP products will be damaged: the product's capacitance will decrease by approximately 50%, the leakage current will increase significantly (rising to several milliamperes/mA), and the exterior of the capacitor will be damaged.

◆其它说明 Others

\*本产品不含铅、镉等元素

This product does not include Plumbum or Cadmium.

[illegible]

Note: The content provided above is the product specification. Fenghua reserves the right to modify this content without prior notice when the product remains unchanged. Any product changes will be notified to customers via PCN.