承 認 書

SPECIFICATION

客 戶: (Customer)	许继电气
品 名: (Product Name)	铝电解电容器
规 格: (Specifications)	LHT 250V1500UF D35*45MM
日 期: (Date)	2023 年 6 月 21 日

供應商簽署欄 Supplier confirmation		
PREPARED BY	CHECKED BY	APPROVED BY
技术中心 王学莲	技术中心 刘 平	技术中心 刘太平

客戶確認簽署欄 Customer confirmation

珠海華冠電容器股份有限公司

ZHUHAI LEAGUER CAPACITOR CO.,LTD.

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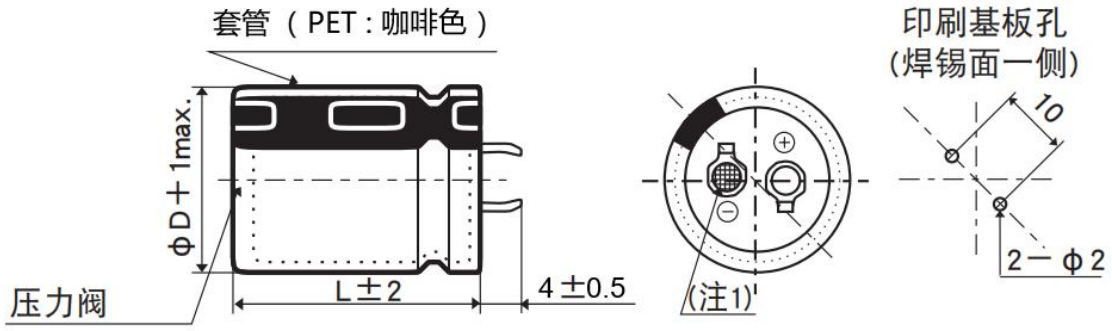
序号 No.	更改原因 Explanation of changes	更改内容 Content	修订人 Reviser	生效日期 Effective date
1	新版	新版	王学莲	2023/6/21

华冠电容规格承认书目录

Leaguer product specification content

1、 Standard Rating 基本参数

●端子代码：LP（φ 22~35）： 标准品



（注1）阴极端子的铆钉部网眼刻印。

单位 Unit : mm

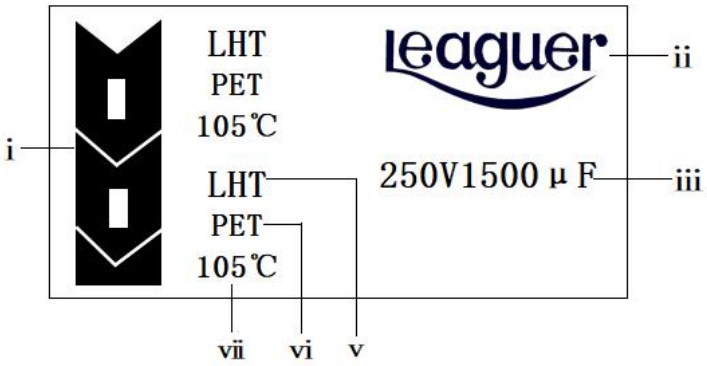
No.	Customer Part No.	LEAGUER Part No.	Capacitance (uF)	Tolerance on Rated Capacitance (%)	Rated Voltage (Vdc)	Surge Voltage (Vdc)	Operating Temp. Range (℃)	tanδ (120Hz) (Max)	Leakage Current (uA)(5min.)	Max Ripple Current (A) at105℃120Hz	Endurance at 105℃ (Hours)	Dimensions (mm)	
												φD	L
1		LHT2E152MF045LP	1500	±20	250	275	-40~+105	0.15	1837.1	2.20	3000	35	45

2、CONDITION OF TEST 测试环境

如果没有其他规定，标准的测试、检验环境条件如下所示：
环境温度：15℃~35℃
相对湿度：45%~75%
大气压力：86kpa~106kpa
如果对测试结果有异议，可以在以下条件测试：
环境温度：20±1℃
相对湿度：60%~67%
大气压力：86kpa~106kpa
Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests are as follows
Ambient temperature ： 15℃ to 35℃
Relative humidity ： 45% to 75%
Air pressure ： 86kpa to 106kpa
If there may be doubt on the results, measurements shall be made within the following limits
Ambient temperature ： 20±1℃
Relative humidity ： 60% to 67%
Air pressure ： 86kpa to 106kpa

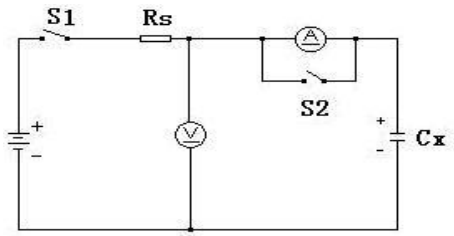
3、Marking 标示

Following items shall be marked on the sleeving；Sleeve color：Brown；Marking color：White.
电容器的套管上印刷以下内容;套管颜色：咖啡色；标记颜色：白色。

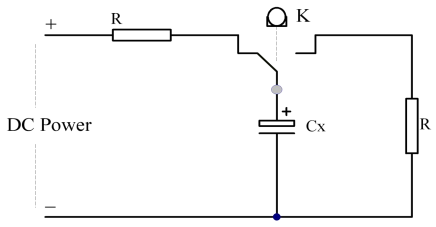


i.	Negative Polarity	负极标示
ii.	LEAGUER	商标
iii.	Rated Voltage and Capacitance	额定电压&容量
iv.	Negative Polarity ⊖–NEG	负极端子标识
v.	Series	系列代码
vi.	PET	套管材质标识
vii.	105℃	产品使用上限温度

4、 Electrical Requirements 电性能要求

<table>
<tr><th>序号
No.</th><th>项目
Item</th><th>测试方法
Test method</th><th>性能
Performance</th></tr>
<tr><td>4.1</td><td>额定工作电压
Rated voltage</td><td></td><td>16V.DC~550V.DC</td></tr>
<tr><td>4.2</td><td>电容量
Capacitance</td><td>测试频率：120Hz(±20%)
测试电路：串联等效
测试电压：0.5Vrms 以下
Measuring frequency: 120Hz±20%
Measuring circuit : Series equivalent circuit
Measuring voltage : 0.5Vrms or less</td><td>容量范围：
68μF ~47000μF
容量偏差：-20%~+20%
Range of Capacitance:
68μF ~47000μF
Capacitance tolerance:
-20%~+20%</td></tr>
<tr><td>4.3</td><td>损失角正切值
Dissipation factor</td><td colspan="2">测试条件与 4.2 电容量测试相同
Testing conditions are the same as 6.2 for capacitance
<table>
<tr><td>W.V</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63~100</td><td>160~250</td><td>400~550</td></tr>
<tr><td>Tg δ</td><td>0.50</td><td>0.40</td><td>0.35</td><td>0.30</td><td>0.20</td><td>0.15</td><td>0.20</td></tr>
</table></td></tr>
<tr><td>4.4</td><td>漏电流
Leakage current</td><td>在电容器两端施加额定工作电压，并串联 1000±100Ω电阻，在施加规定时间电压后，测量漏电流。
测试电路如下图：
The rated voltage shall be applied across the capacitor and its protective resistor shall be 1000±100Ω. The leakage current shall then be measured after an electrification period of schedule time.
Measurement circuit
 

Rs: Protective resistor(1000±100Ω)
DC ammeter
DC voltmeter
S_1: Switch
S_2: Protective switch for an ammeter</td><td>16V~550V:
I≤3 $\sqrt{CV}$ （5 分钟后）
16V~550V:
I≤3 $\sqrt{CV}$ （after 5 min）
I：漏电流（μA）
C：容量（μF）
V：额定工作电压（V）
I：Leakage current(μA)
C：Capacitance(μF)
V：Rated voltage (V)</td></tr>
<tr><td>4.5</td><td>低温特性
Low Temperature Characteristics (at 120Hz)</td><td colspan="2">
<table>
<tr><td>WV</td><td>400~500</td></tr>
<tr><td>$Z_{-25℃}/Z_{+20℃}$</td><td>6</td></tr>
<tr><td>$Z_{-40℃}/Z_{+20℃}$</td><td>8</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>序号
No.</th><th>项目
Item</th><th>测试方法
Test method</th><th>性能
Performance</th></tr>
<tr><td>4.6</td><td>Characteristics at High and Low Temperature
高低温特性</td><td>
<table>
<tr><th>Step</th><th>Test Temperature</th><th>Time</th></tr>
<tr><td>1</td><td>20±2℃</td><td>-</td></tr>
<tr><td>2</td><td>-25±3℃</td><td>2 hours</td></tr>
<tr><td>3</td><td>20±2℃</td><td>15min</td></tr>
<tr><td>4</td><td>105±2℃</td><td>2 hours</td></tr>
</table>
阶段 1：测量容量和阻抗（|z| 20℃ 120Hz±20%）
阶段 2：电容器恒温贮存 2 小时，在热平衡状态测阻抗（|z| -25℃ 120Hz±20%）
阶段 4：电容器恒温贮存 2 小时，在热平衡状态测漏电流
Step 1:Capacitance and impedance shall be measured. （|z| 20℃ 120Hz±20%）
Step 2:After the capacitor being stored for 2 hours, impedance shall be measured at thermal stability. （|z| -25℃ 120Hz±20%）
Step 4:After the capacitor being stored for 105℃2 hours, leakage current shall be measured. The measurement shall be made at thermal stability</td><td>阶段 2
阻抗比：相对于阶段 1 比值小于 4.5 中的值
Step2
Impedance ratio: relative to Step2, the ratio is less than the value in 4.5
阶段 4
漏电流：小于或等于规定值的 5 倍
Step4
Leakage Current : Less than 500% of the specified value</td></tr>
<tr><td>4.7</td><td>耐浪涌电压
Surge Test</td><td>对电容器施加浪涌电压，每充电 30s，放电 5min30sec，连续循环 1000 次后测量。
测试温度：15~35℃。
After surge voltage(the value of page 2) applied at a cycling rate of 30 seconds charge and 5.5 minutes discharge 1000 successive test cycle.
Test temperature:15~35℃.</td><td>漏电流：≤第 2 页规定值
Leakage Current : Less than the specified value of page 2
容量变化：与初始测量值比变化率 ±15%范围内
Capacitance Change : Within ±15% of the initial measured value
损耗角正切值：规定值的 130%.
Tangent of Loss Angle : Less than 130% of specified value</td></tr>
<tr><td></td><td></td><td colspan="2">Test circuit
 

Note: This requirement is applicable only to instantaneous over voltage which may be applied to terminals of capacitor, therefore, not applicable to such over voltages as often applied.</td></tr>
<tr><td>4.8</td><td>可焊性
Solderability</td><td>温度： 230±2℃
浸入时间：2±0.5sec
助焊剂：约 25%的松香溶于酒精
Temperature : 230±2℃
Immersing Time: 2±0.5sec
Flux: Approx. 25% rosin in Ethanol</td><td>引线端子表面 90%以上的面积附着新焊料。
More than 90% of the terminal surface shall be covered with new solder.</td></tr>
</table>

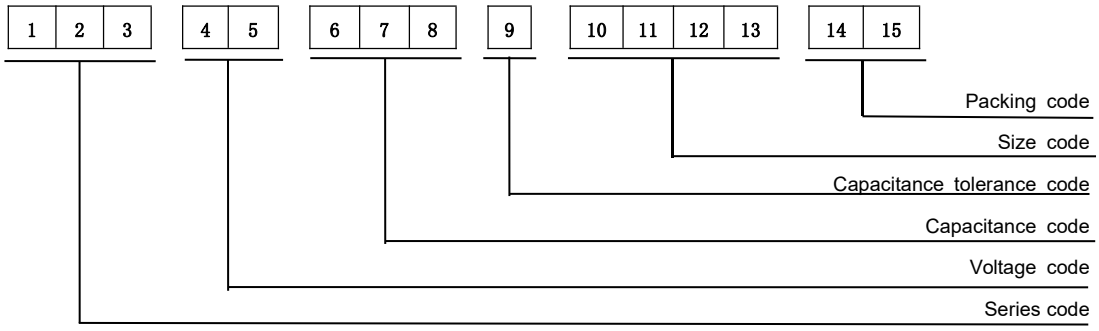
序号 No.	项目 Item	测试方法 Test method	性能 Performance
4.9	振动 Vibration	频率：10 到 55 Hz，每分钟互换 振幅：0.75mm 在互相垂直的 3 个方向上，每个方向振动 2 小时，共 6 小时。 Frequency: 10~55Hz reciprocation for 1 min Total amplitudes: 0.75mm Direction and during of vibration: 3 orthogonal directions, Mutually each for 2hrs total 6hrs	容量：在测试的 30 分钟内，电容量测试值无明显变化 外观：无可见损伤 容量变化：容量变化率在±10%范围内 Capacitance : Within 30 minutes of the test, the capacitance test value has no obvious change Appearance: No significant change can be observe Capacitance change : Within ±10% of initial measured value
4.10	耐焊接热 Resistance to soldering heat	焊槽法：Solder bath method： 焊锡温度：260±5℃ Solder bath temperature : 260±5℃ 浸入时间：10±1 秒 Immersion time : 10±1sec. 电路板 ：1.6mm Printed wiring board: 1.6mm	外观：无可见损伤 容量变化：容量变化率在±10%范围内 Appearance: No significant change can be observe Capacitance change : Within ±10% of initial measured value
4.11	稳态湿热 Resistance to damp heat (steady state)	电容器放置在温度 60℃、湿度 90~95%的环境下 500±6 小时，然后放置在标准环境中恢复 1-2 小时 Capacitors shall be exposed for 500±6hrs in an atmosphere of 90~95% R.H. at 60℃. And then the capacitor shall be subjected to standard atmospheric conditions for 1-2 hours, after which measurements shall be made.	容量变化：与初始测量值比变化率在±20%范围内。 损耗角正切值：≤规定值的 1.5 倍 漏电流：≤规定值 外观：无可见损伤 Capacitance Change: Within ±20% of the initial measured value Tangent of Loss Angle : Less than 150% of the specified value Leakage Current : Less than the specified value Appearance : No significant change can be observed.
4.12	高温负荷寿命 High Temperature Unload Life Test	温度: 105±2℃ 试验持续时间：3000 小时 。 施加电压：额定电压 试验完成后，电容器在测量前应在室温中恢复 16 小时。 Test Duration: 3000hours。 Applied Voltage: Rated Voltage After subjected to the test, the capacitors shall be left at the room temperature for 16 hours prior to the measurement.	容量变化:与初始测量值比变化率在±20%范围内。 损耗角正切值 :≤规定值的 2 倍 漏电流 :≤规定值 外观:无可见损伤 Capacitance Change: Within±20% of the initial measured value Tangent of Loss Angle : Less than 200% of the specified value Leakage Current : Less than the specified value Appearance: No significant change can be observed.

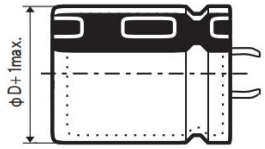
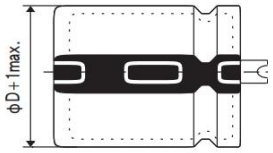
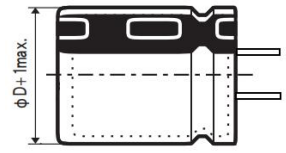
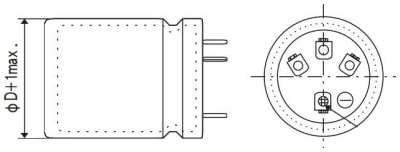
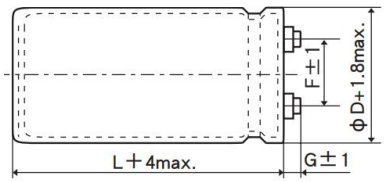
序号 No.	项目 Item	测试方法 Test method	性能 Performance
4.13	高温储存 High Temperature Unload Life Test	温度: 105±2℃ 试验持续时间：1000 小时 试验完成后，电容器在测量前应在室温中恢复 16 小时。 Test Temperature: 105±2℃ Test Duration: 1000 hours After subjected to the test, the capacitors shall be left at the room temperature for 16 hours prior to the measurement.	容量变化:与初始测量值比变化率在±20%范围内。 损耗角正切值 :≤规定值的 2 倍 漏电流 :≤规定值的 2 倍 外观:无可见损伤 Capacitance Change: Within±30% of the initial measured value Tangent of Loss Angle : Less than 200% of the specified value Leakage Current : Less than 200% of the specified value Appearance: No significant change can be observed.
4.14	防爆试验 Safety vent	在电容器两极施加反向工作电压，其中通过的电流为 1 A，在测试时防爆装置应能在 30 分钟内动作。 The capacitor shall be subjected to a reverse D.C. voltage equal to the rated D.C.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.	上述过程中应无引线、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.

■ 额定纹波电流频率系数 Coefficient of Frequency for Rated Ripple Current

Frequency / Rated Voltage	120Hz	1KHz	10KHz	100KHz
≤ 100V	1.00	1.13	1.19	1.20
160~250V	1.00	1.32	1.45	1.50
≥ 315V	1.00	1.30	1.41	1.43

5、PART NO SYSTEM 物料编码



1 2 3	4 5		6 7 8		9		10 11 12 13		14 15	
Series code	Voltage (V)	Code	Capacitance (μF)	Code	Tol.(%)	Code	Size	Code	Packing	Code
LHS	16	1C	39	390	±5%	J	22×20	C020		LP
LHA	25	1E	47	470	±10%	K	22×25	C025		
LHK	35	1V	56	560	±15%	Y	22×30	C030		
LHL	50	1H	68	680	±20%	M	22×35	C035		
LHT	63	1J	100	101	-10～-30%	Q	22×40	C040		LT
FTT	80	1K	220	221	Others	T	22×45	C045		
FTH	100	2A	330	331			22×50	C050		
	160	2C	470	470			25×25	D025		
	180	2J	680	680			25×30	D030		LG
	200	2D	1000	102			25×35	D035		
	220	2P	2200	222			25×40	D040		
	250	2E	3300	332			25×45	D045		
	315	2F	4700	472			25×50	D050		LF
	330	2U	6800	682			30×25	E025		
	350	2V	10000	103			30×30	E030		
	400	2G	22000	223			30×35	E035		
	420	2M	33000	333			30×40	E040		SW
	450	2W	47000	473			30×45	E045		
	500	2H					30×50	E050		
	550	2J					35×25	F025		
							35×45	F045		
							35×35	F035		
							35×40	F040		
							35×45	F045		
							35×50	F050		

6. Storage and Shipment 储存与运输

6.1 储存: 铝电解电容器应贮存于阴凉通风、清洁、干燥的库房内，空气中不得有腐蚀气体和环境中微生物污染，不得接触有机溶剂。

Storage: The aluminum electrolytic capacitor should be stored in a shady and cool,clean and dried. Storeroom, And the air can not have corrosion gas and environment microbial contamination, may not touch the organic solvent.

6.2 运输: 包装好的产品均能承受汽车、火车、轮船和飞机等运输工具的不利因素。运输时，应注意防水和机械损伤。运输中应防止雨雪淋袭和强烈震动。不得与有毒害、有异味、有腐蚀性物品混装。搬运时小心轻放，避免包装箱损伤破裂。

Shipment: For packaged products should can be endured all kinds of transport factors such as cars,trains, ships and planes. Please pay attention to avoid waterproof and mechanical damage issues in transporation. It also should prevent the rainand snow shower and strong vibration attacks in transit. May not have a poisonous and peculiar smell, corrosive goods mixed packing. Handling should be carefully handled and avoid injury package burst.

7. Packing 包装

7.1 包装箱尺寸及数量 (Dimension and qty of packing container)

产品尺寸（直径 mm) Dimension(parameter/mm)	ϕ22～ϕ25	ϕ30～ϕ35
每箱数量(PCS) Qty/ctn	340	208

7.2 铝电解电容器的外包装箱上应清晰标出:

The outer carton of aluminum electrolytic capacitor should be marked clearly for the following:

A. 产品型号 Series

B. 规格: 标称电容量、容量允许偏差、额定电压

Specification : Capacitance, Capacitance Tolerance, Rated Voltage

C. 产品尺寸 Dimension

D. 生产批号 Production lot#

E. 数量 Qty

F. 客户料号(客户有要求时) Clients part# (When it's needed)

G. 客户订单号(客户有要求时)Clients order# (When it's needed)

8、OTHER REMARKS 其它说明

8.1 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 DC aluminum electrolytic capacitors are normally polarized

当直流铝电解电容器按反极性接入电路时，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电压，请选无极性产品。

When reverse voltage is applied on DC aluminum electrolytic capacitor ,the circuit will be short out and the capacitor will be damaged due to abnormal current flows through the capacitor. Please use non- polar types of capacitors when the positive voltage is applied on the cathode terminal.

(2)在额定工作电压以下使用 Use capacitor within rated voltage

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内劣化直至损坏。请注意电压峰值勿超出额定工作电压。

When capacitor is used at higher voltage than the rated voltage, leakage current may increase and characteristics may be drastically deteriorated and damaged in a short period. Please take extra caution that the peak voltage should not exceed the rated voltage.

(3)作快速充放电使用 Sudden charge and discharge

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。

When aluminum electrolytic capacitors for general purpose-use are employed in rapid charge and discharge application, its life expectancy may be shortened resulted from capacitance decrease, heat rise, etc.

(4)电容器贮存 Storage of the capacitor

①请保管在室温 5～35℃，湿度 75%以下的环境。

we recommend the following conditions for storage: Ambient temperature：5~35℃ ,Ambient humidity：<75%RH;

(a)产品储存期限: ≤12 个月； Storage life: ≤ 12 months;

(b) 产品储存期限>12 个月时，需充电后再使用；

If storage life >12 months， the products need to be charged again before using;

(c) 存放时间超过 2 年的电解电容器应报废处理；

If Storage time > two years, the products need to be discarded;

(5)施加纹波电流应小于额定值 Use capacitor within rated ripple current

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。

If excessive ripple current is applied on the capacitor, which will result in generating excessive heat inside, reducing capacitance and shortening life of capacitor. Therefore the peak value of the ripple voltage should be less than the rated value.

(6)使用环境温度 Ambient temperature

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。

Life of aluminum electrolytic capacitor is affected by the ambient temperature. It is generally known that the life doubles for each 10℃ decrease in temperature.

(7)引出线强度 Tensile strength of lead wire

当拉力施加到电容器引出线，该拉力将作用于电容器内部，这可能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。

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

(8)焊接过程耐热性 Heat resistance at the soldering process

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。

During soldering process, secondary shrinkage or sleeve crack may occur when soldering temperature is too high or soldering time is too long.

(9)电路板的安装孔孔距及安装位置 Hole pitch and position of PC board

电路板安装孔的设计应与产品说明书的引线脚距相一致，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，这可能导致短路或漏电流上升。

When designig a PC board , its hole pitch should be designed to coincide with the lead pitch (lead spacing) of the capacitor specified in the catalog or specifications.When a capacitor is forcibly inserted into an unmatched hole pitch, a force will put on the leads and which could result in a short circuit or increased leakage current.

(10) 关于焊接以后的清洗 Cleaning after soldering

① 电容器不能用卤化有机物系列的清洗剂进行清洗。如果必须进行清洗，请使用能够保证电容器质量的清洗剂。

The aluminum electrolytic capacitors should be free of halogenated solvents during board cleaning after soldering. Use solvent proof capacitors when halogenated solvents are used.

② 对于能够保证电容器质量的清洗剂，清洗后请不要在清洗溶液或者密封容器中保管。清洗后的电容器请和电路板一起在热风下干燥 10 分钟以上，热风的温度不可高于电容器规定上限温度。

After cleaned with the solvent which can guarantee the quality of capacitors, the capacitors should not be kept in solvent environments of non-ventilated places. Let the capacitors after cleaning dry with hot blast fully above 10mins and the temperature of hot blast should not be over than specified upper limit of that of capacitors.

(11) 关于固定剂以及镀层（涂层剂）Adhesives、fixative and coating materials(coating agent)

① 请不要使用含有卤化有机物系列的固定剂及镀层（涂层剂）。

Do not use halogenated adhesives and coating materials to fix aluminum electrolytic capacitors.

② 请不要让固定剂及镀层（涂层剂）将电容器封口部位（端子一侧）全部封住。

Do not cover up all the sealing area of capacitors with adhesives、fixative or coating materials (coating agent), make coverage only partial.

8.2 符合 RoHS　　RoHS compliance

符合欧盟 RoHS 的最新标准，若客户有特殊要求，按照双方签订的相关协议为准。

Completely in accordance with the latest standard of RoHS or relevant agreements reached by both parts if customer has special requirements.