



Electrolytic Capacitor

SPECIFICATION

Serial No: Spec21032505

Version No: A 0

Customer:

Client P/N:

Specification: LHL500V220 μ F 30X30 $\pm$ 20%

Load life: 105 $^{\circ}$ C 2000H

Customer(Release)

Supplier		
WRITTEN	CHECKED	APPROVED
ZONGXIANG CHENG	JUNHUA LV	JUKE CHEN

Form No.: EDW16R07A0

DONGGUAN CITY DONGYANGGUANG CAPACITORS CO., LTD.

2ND INDUSTRIAL AREA JINXIA HEDONG ROAD CHANGAN, DONGGUAN

TEL: (0769) 85315188

FAX: (0769) 85313518

目录 CATALOG

序号 NO.	资料名称 Name	页数 Page
1	变更履历表 Change record	3
2	铝电解电容器规格表 Spec table	4
3	适用范围 Adapt range	5
4	使用温度范围 Operating temperature rang	5
5	浪涌电压 Surge voltage	5
6	损耗 Dissipation factor	5
7	低温特性 Stability at low temperature	5
8	纹波电流系数 Multiplier for ripple current	5
9	外形图及尺寸表 Case size table	6
10	构造图及材料表 Frame drawing and materials	6
11	性能特性 Specifications	7-10
12	寿命推算 Estimation of useful life	11
13	标志 Marking	12
14	包装 Packing	12
15	生产厂址 Production site	13
16	RoHS 符合性声明 Declaration of conformity	13

变更履历表 **Change Record**

序号 No.	日期 Date	版号 Issue No.	修订记录 Revision records	校订 Reviser
1	2021-03-25	A0	The 1 st issue	ZONGXIANG CHENG

铝电解电容器规格表 SPEC TABLE

东阳光料号 HEC P/N	额定电压 R.V. (V)	浪涌电压 S.V. (V)	容量 CAP (μ F)	容差 Cap.Tol .(%)	损耗角正切 tg σ (%)	漏电流 LC (uA)/5min	纹波电流 Ripple current (Arms) (105℃ 120Hz)	工作温度 Temp (℃)	尺寸 D×L (mm)		耐久性 Load life/105℃ (Hrs)	客户料号 USER P/N
LHL500TC221M 030BEGHT	500	550	220	-20~20	20	995	1.05	-25~105	30	30	2000	/

一、适用范围 Adapt Range

本产品规格书适用于东阳光电容器有限公司 LHL 型铝电解电容器产品。

The product specification is adapted to series LHL Aluminum Electrolytic Capacitors of HEC

二、使用温度范围 Operating temperature range

-25~+105℃ (U=500~650V)

三、浪涌电压 Surge voltage

额定电压 Rated voltage(V)	6.3	10	16	25	35	50	63	80	100	160
浪涌电压 Surge voltage(V)	8	13	20	32	44	63	79	100	125	200
额定电压 Rated voltage(V)	200	220	250	315	350	400	420	450	500	550
浪涌电压 Surge voltage(V)	250	260	300	365	400	450	470	500	550	600

四、损耗 Dissipation factor(20℃, 120Hz)

额定电压 Rated voltage(V)	500
损耗 $\tan\delta$	0.20

五、低温特性 Stability at low temperature

额定电压 R.V	500
阻抗 _{L-25℃} /阻抗 _{L+20℃} Z _{-25℃} /Z _{+20℃}	8
阻抗 _{L-40℃} /阻抗 _{L+20℃} Z _{-40℃} /Z _{+20℃}	-

六、纹波电流系数 Multiplier for ripple current

频率校正因子 Frequency Correction Factor

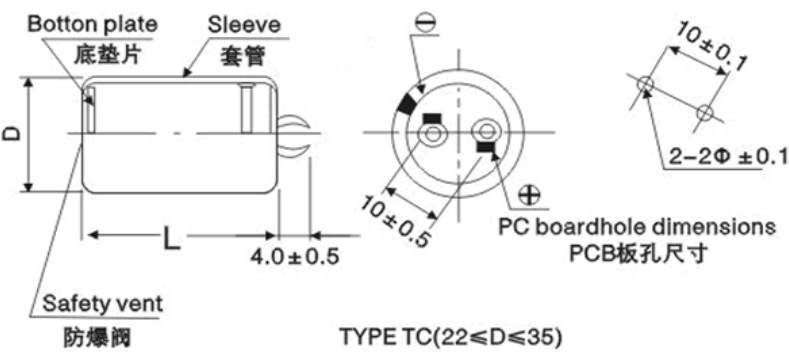
Freq (Hz) R.V. (V)	50/60	100/120	300	1K	10K~20K	50K~100K
500 to 650	0.77	1.00	1.16	1.30	1.41	1.43

温度系数 Temperature Coefficients

Temperature (℃)	45	60	70	85	105
Factor	2.70	2.30	1.90	1.73	1.00

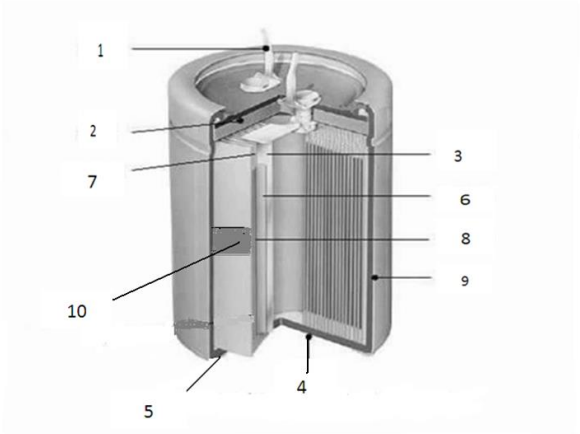
七、外形图及尺寸表 Case size table

LHL 系列图示



D±1.5	L±3.0
30	30

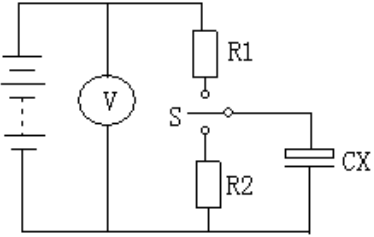
八、构造图及材料表 Frame drawing and materials

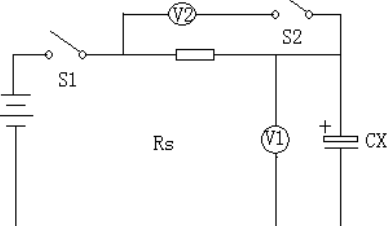


LHL 系列:

序号 No.	部件名称 Parts		材质 Material	供应厂家名称 Main supply Factory
1	引出端子 Terminal		99.5%纯度铝 AL-99.5%	泉龙 QUANLONG
2	盖板 Terminal Board	端子 Terminals	Fe: 96.618% Cu: 0.966% Sn: 2.416%	
		板材 Resin	覆胶板(EPT)Rubber Bakelite	
3	引出条 Lead Tab		99.99%纯度铝 AL-99.99%	吴江飞乐 WU JIANG FEI LE
4	有颈铝壳 AL-Case		99.5%纯度铝 AL-99.5%	创佳铝壳 CHUANG JIA
5	垫片 Bottom Disk		PP	东阳花厅 DONG YANG HUA TING
6	阳极箔 Anode Toil		99.98%纯度铝 AL-99.98%	深圳市东阳光化成箔股份有限公司 HEC
7	电解纸 Separator		Electrolytic paper	MHSP/NKK/KAN
8	阴极箔 Cathode Toil		99.7%纯度铝 AL-99.7%	吴江飞乐 WU JIANG FEI LE
9	套管 (黑色) Sleeve		PET (Black)	云林 YUN LIN
10	胶带 Sealing tape		聚丙烯 Polypropylene	杭州和联 HANG ZHOU HE LIAN

九、性能特性 Specifications

项目 Item	试验条件 Test Conditions	性能要求 Requirements	
最大允许额定纹波电流 Maximum permissible rated ripple current	温度 Temperature: $105 \pm 2^{\circ}\text{C}$; 电压: 直流电压+交流电压峰值 $\leq$ 标称电压 Voltage: DC voltage + peak ripple voltage $\leq$ Rated voltage	参考第四页铝电解电容器规格表 Refer to the SPEC TABLE in page 4	
浪涌电压 Surge Voltage	温度 105°C , 充电 30 ± 5 秒, 放电 5 ± 0.5 分, 共循环 1000 次。 常温常湿放置 1~2 小时, 达到平衡状态再进行测定 At Temperature 105°C , 1000 cycles of 30s on and 330s off, and the capacitor shall be stored 1~2 hours under standard atmospheric conditions to obtain thermal stability, after which measurement shall be made Test voltage : Refer to the SPEC TABLE in page 4 Test temperature: 105°C 测试回路 Measurement circuit  R1: 串联保护电阻($1\text{k}\Omega$) Protective series resistor ($1\text{k}\Omega$) V: 直流电压表 DC voltage meter R2: 放电电阻 Discharge resistor ($1\text{k}\Omega$) S: 切换开关 Switch CX: 待测电容器 Test capacitor	无可见损伤 No visible damage	
		$\Delta C/C$	$\leq \pm 15\%$
		$\text{tg}\delta$	$\leq \pm 200\%$ 初始规定值 $\leq \pm 200\%$ Initial specified value
		LC	$\leq$ 初始规定值 $\leq$ Initial specified value
初期性能特性 Performance characteristics of the initial 静电容量(允许偏差) capacitance(tolerance)	测试频率: 120Hz Measuring frequency: 120Hz 测试电压: 0.5Vrms or less Measuring voltage: 0.5Vrms or less DC bias voltage: +1.5~2.0 VDC	静电容量允许偏差: $\leq \pm 20\%$ Capacitance tolerance: $\leq \pm 20\%$	
损耗角正切($\text{tg}\delta$) Tangant of angle		参考第四页铝电解电容器规格表 Refer to the SPEC TABLE in page 4	

项目 Item	试验条件 Test Conditions	性能要求 Requirements																							
漏电流 Leakage Current	电容器接 $1000 \pm 10 \Omega$ 的保护电阻施加电压 5 分钟后测试电流。 The rated voltage shall be applied across the capacitor and its protective resistor which shall be: $1000 \pm 10 \Omega$. Then the leakage current shall be measured after an electrification period of 5min. The leakage current shall be calculated by the following equation. Leakage current: $I = E/R_s$ E: 直流电压表值 voltage measured with DC voltmeter R_s: 标准电阻的阻值 Resistance of the protective resistor 测定电路 measurement circuit  电压降法 voltage drop method R_s: 标准电阻的电阻值 ($1000 \pm 10 \Omega$) R_s: protective resistor ($1000 \pm 10 \Omega$) V1 或者 V2: 直流电压表 V1 or V2: DC Voltmeter or electronic voltmeter S1: 开关 switch S2: 电压表保护用变换开关 Protective switch for a voltmeter and the test capacitor	$I \leq 3 \cdot \sqrt{CV}$ (After 5 minutes)																							
高低温特性 Characteristic at high and low temperature	电容器根据下表的顺序处理: The capacitor shall be subjected in turn to the procedures specified below: <table border="1"> <thead> <tr> <th>阶段 step</th><th>温度 Temperature</th><th>时间 Time</th></tr> </thead> <tbody> <tr> <td>1</td><td>$20 \pm 2^\circ\text{C}$</td><td>热平衡状态</td></tr> <tr> <td>2</td><td>$-25 \pm 0/-3^\circ\text{C}$</td><td>2 hours</td></tr> <tr> <td>3</td><td>$20 \pm 2^\circ\text{C}$</td><td>热平衡状态</td></tr> <tr> <td>4</td><td>$105 \pm 0/-3^\circ\text{C}$</td><td>2 hours</td></tr> </tbody> </table> * 电容器上施加额定电压, 频率为 100Hz 或 120Hz 放置在每一温度下, 待阻抗或电容稳定后方可测试。 * Places rated voltage on the capacitor, the frequency of 100 Hz or 120 Hz is placed at each temperature, can test after resistance or capacitance stability. 阶段 1、3: 测试容量、损耗和阻抗值 Step1&3&5: Capacitance, Dissipation Factor and impedance shall be measured. 阶段 2、4: 放置 2h 后, 达到热平衡状态即可测试 Step2&4: After the capacitor being stored for 2h, Capacitance, Dissipation Factor and impedance shall be measured. The measurement shall be at thermal stability.	阶段 step	温度 Temperature	时间 Time	1	$20 \pm 2^\circ\text{C}$	热平衡状态	2	$-25 \pm 0/-3^\circ\text{C}$	2 hours	3	$20 \pm 2^\circ\text{C}$	热平衡状态	4	$105 \pm 0/-3^\circ\text{C}$	2 hours	<table border="1"> <tbody> <tr> <td>阶段 2 Step2</td><td>阻抗比 $Z_{低温}/Z_{高温}$</td><td>见“五” Refer to “五”</td></tr> <tr> <td rowspan="2">阶段 4 Step4</td><td>$\Delta C/C$</td><td>$\leq \pm 20\%$ 初始测量值 $\leq \pm 20\%$ of the initial value</td></tr> <tr> <td>LC</td><td>≤ 8 倍初始规定值 $\leq 800\%$ of the specified value</td></tr> </tbody> </table>	阶段 2 Step2	阻抗比 $Z_{低温}/Z_{高温}$	见“五” Refer to “五”	阶段 4 Step4	$\Delta C/C$	$\leq \pm 20\%$ 初始测量值 $\leq \pm 20\%$ of the initial value	LC	≤ 8 倍初始规定值 $\leq 800\%$ of the specified value
阶段 step	温度 Temperature	时间 Time																							
1	$20 \pm 2^\circ\text{C}$	热平衡状态																							
2	$-25 \pm 0/-3^\circ\text{C}$	2 hours																							
3	$20 \pm 2^\circ\text{C}$	热平衡状态																							
4	$105 \pm 0/-3^\circ\text{C}$	2 hours																							
阶段 2 Step2	阻抗比 $Z_{低温}/Z_{高温}$	见“五” Refer to “五”																							
阶段 4 Step4	$\Delta C/C$	$\leq \pm 20\%$ 初始测量值 $\leq \pm 20\%$ of the initial value																							
	LC	≤ 8 倍初始规定值 $\leq 800\%$ of the specified value																							

项目 Item	试验条件 Test Conditions	性能要求 Requirements
S 对策	施加正向 1.5 倍额定电压，施加电流 1A	烟雾垂直底部喷；，防爆阀轻微打开，无起翘；电解纸无露出；盖板（皮头）无起鼓，卷边无漏液；解体无打火击穿。
负荷寿命 Load Life	在 $105\pm 2^{\circ}\text{C}$ 施加额定纹波电流，且施加的直流电压和交流电压的峰值之和要等于额定电压。2000+72h 后,标准状态下恢复 16 小时后进行测试。 After applying rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) with specified ripple current for 2000+72h at $105\pm 2^{\circ}\text{C}$ and then resumed 16 hours, which measurement shall be made.	漏电流：不超过规定值 Leakage current: $\leq$ Initial specified value 容量变化：初始值的 $\pm 20\%$ 以内 Capacitance change: Within $\pm 20\%$ of intial value 损耗角正切：不超过规定值的 2 倍 Dissipation factor : $\leq 200\%$ of intial specified value 外观 Appearance: 1. 无可见损伤和无电解质漏出 No remarkable damage and electrolyte leakage 2. 底部允许轻微起鼓 Bottom allowed slightly plumped
高温贮存测试 High Temp Shelf Life test	在 $105\pm 2^{\circ}\text{C}$,1000+36h 小时贮存后取出,在室温下恢复 16 小时后测量。 After storage for 1000 +36 hours at $105\pm 2^{\circ}\text{C}$ then resumed for 16hours at room temp, the Cap、 $\text{tg}\delta$ and Lc shall be measured.	漏电流：不超过规定值 Leakage current: $\leq$ Initial specified value 容量变化：初始值的 $\pm 20\%$ 以内 Capacitance change: Within $\pm 20\%$ of intial value 损耗角正切：不超过规定值的 1.5 倍 Dissipation factor : $\leq 150\%$ of intial specified value 外观 Appearance: 无明显异常 No remarkable abnormality
可焊性 Solder ability	浸渍时间 Solder press time: $2\pm 0.5\text{s}$ 焊接温度 Solder temperature: $245\pm 5^{\circ}\text{C}$	浸渍面积 95%以上附着 Impregnation area of more than 95% attached
耐焊接热 Resistance to welding heat	温度: $270\pm 5^{\circ}\text{C}$ Test temperature: $270\pm 5^{\circ}\text{C}$ 时间: $10\pm 1\text{s}$ Test time: $10\pm 1\text{s}$	漏电流：不超过规定值 Leakage current: $\leq$ Initial specified value 容量变化：初始值的 $\pm 20\%$ 以内 Capacitance change: Within $\pm 20\%$ of intial value 损耗角正切：不超过规定值的 1.5 倍 Dissipation factor : $\leq 150\%$ of intial specified value 外观 Appearance: 无明显异常 No remarkable abnormality

项目 Item	试验条件 Test Conditions	性能要求 Requirements
耐湿性 Resistance of damp heat	温度: $40 \pm 2^{\circ}\text{C}$ Test temperature: $40 \pm 2^{\circ}\text{C}$ 湿度: 93%RH Relative humidity: 93%RH 时间: $500 \pm 8\text{Hrs}$ 试验后常温放置 24~48 小时 To expose in the atmospheric condition for 24 to 48 hours after completion of test	漏电流: 不超过规定值 Leakage current: $\leq$ Initial specified value 容量变化: 初始值的 $\pm 3\%$ 以内 Capacitance change: Within $\pm 3\%$ of initial value 损耗角正切: 不超过初始值的 1.5 倍 Dissipation factor: $\leq 150\%$ of initial value 外观 Appearance: 无明显异常 No remarkable abnormality
耐振性 Resistance to vibration	频率: 10-55-10Hz/分 Frequency: from 10 to 55Hz and return to 10Hz, shall be transferred in 1 Min Total amplitude: 1.5mm 条件: X、Y、Z 方向各 2 小时 Direction and duration of vibration: 3 orthogonal directions mutually Each for 2 hours total 6 hours.	静电容量测试时, 无接触不良, 断线及短路, 端子无机械损伤。 Capacitance: during the test, measured value to be stabilized, appearance: no remarkable abnormality 静电容量变化: 初始值的 $\pm 2\%$ 以内 Capacitance change: within $\pm 2\%$ of the initial value

十、寿命推算 Estimation of useful life

铝电解电容器的使用寿命，主要受电容内部电解液的挥发速率决定。电解液挥发后，电容器电容量降低、阻抗增加，会加速产品失效。而电解液挥发的速率，又主要由电容器本体温度决定。电容器本体温度有两个影响因素：1) 环境温度；2) 纹波电流发热。所以电容器的使用寿命也是由这两个因素共同影响。

估算电容器使用寿命有一个经验公式---10K 法则，通俗来讲就是温度每降低 10K，电容器寿命增加一倍。该公式表述如下：

$$L_x = L_0 \times K_t \times K_r \quad \text{式中 } L_x : \text{估算寿命} \quad L_0 : \text{额定寿命} \quad K_t : \text{温度系数} \quad K_r : \text{纹波系数}$$

其中 $K_t = 2^{\frac{T_0 - T_x}{10}}$ ， T_0 为额定上限使用温度， T_x 为环境温度，范围为 20℃--- T_0 。

$$K_r = 2^{\frac{\Delta T_0 - \Delta T_x}{5}}, \text{ 式中 } \Delta T_x = \Delta T_0 \times \left(\frac{I_x}{I_0} \right)^2, \text{ 其中 } I_x \text{ 为实际使用的纹波电流, } I_0 \text{ 为额定纹波电流. } (\Delta T_0 = 5)$$

Useful life of capacitor is mainly effected by volatilization speed of electrolyte in winding. During escaping of liquid, it caused decreasing of capacitance, increasing of impedance, and speed-up the out of use. The volatilization speed is decided by body temperature. There are 2 factors of temperature: 1) environmental temperature; 2) heating by ripple current. The result is, those 2 factors effect useful life of capacitor.

There is an formula to estimate useful life---10K rule, in popular, 10K temperature decreasing, 2times useful life increasing. The formula is:

$$L_x = L_0 \times K_t \times K_r$$

L_x : useful life estimation L_0 : specified useful life

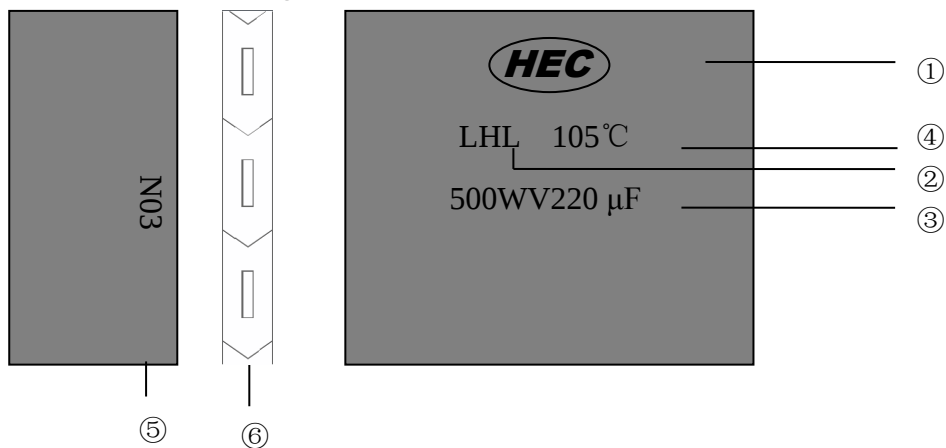
K_t : temperature factor K_r : ripple current factor

$$K_t = 2^{\frac{T_0 - T_x}{10}}, T_0 \text{ is upper limit of temperature, } T_x \text{ is environmental temperature, ranged } 20^\circ\text{C} - T_0. K_r = 2^{\frac{\Delta T_0 - \Delta T_x}{5}}.$$

$$\Delta T_x = \Delta T_0 \times \left(\frac{I_x}{I_0} \right)^2, I_x \text{ is actual value of ripple current, and } I_0 \text{ is specified ripple current. (105}^\circ\text{C products } \Delta T_0 = 5;$$

$$85^\circ\text{C products } \Delta T_0 = 10)$$

十一、标志 Marking



序号 No.	项目 Item
1	商标 Brand
2	产品型号 Products type
3	产品规格 Products specification
4	最高使用温度 Max temperature
5	生产周期 Lot No.(N-----year 2021,03-----the 3 rd month)
6	负极标记 Negative mark

十二、包装 Packing

1、外箱合格证和内箱合格证 Certificate of Outside and inside

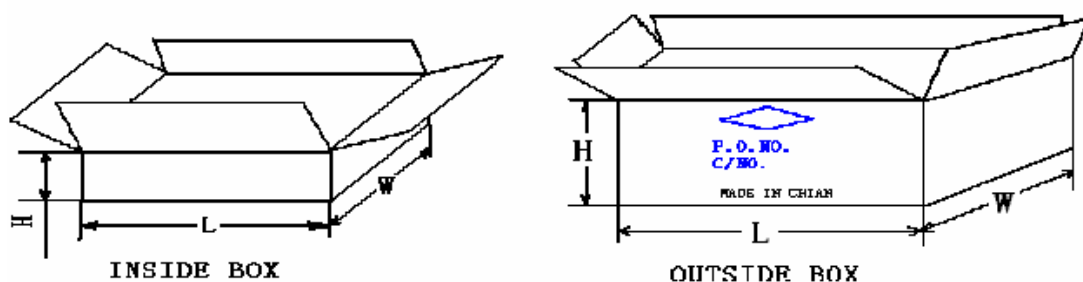
外箱合格证 Certificate of Outside:

	客户名称 :	HEC料号 : /
	客户料号 : /	容量范围 : -20%~+20%
	规 格 : LHL500V220μF	尺寸 : 30X30
	批号 : /	日期 : 2021.03.25
	数量/周期 : 400只/N03	
备注 :		

内箱合格证 Certificate of inside:

	客户料号 : /	客户名称 :
	规 格 : LHL500V220μF	尺寸 : 30X30
	容量范围 : -20%~+20%	数量 : 100只
	批号 : /	日期 : 2021.03.25
		

2、内外箱尺寸及包装数量 Dimensions and packing quantity



Inside Box Dimensions			Outside Box Dimensions			Case Size	Packing	Quantity
L	W	H	L	W	H	$\Phi D \times L$	Inside	Outside
330	325	55	345	338	240	30X30	100	400

十三、生产厂址 Production site

东莞市东阳光电容器有限公司

地址：广东省东莞市长安镇锦厦河东三路19号

Add: No.19, Hedong 3rd Road, Jinxia, Changan Town, Dongguan City, Guangdong Province, China.

电话/Tel: 86-769-85315888-2211(销售)

86-769-85315188 (基地)

传真/ Fax: 86-769-85370229

<http://www.dyg-hec.com>

十四、RoHS 符合性声明 Declaration of conformity

我们东阳光电容器有限公司在此声明，所有发送给贵司的产品（包含原材料、焊接材料、包材和其他随货的辅助材料）都是符合欧盟 RoHS 法规 2011/65/EU。下表是各有害物质可允许的含量。Our company declare that all products sent to your company (including raw materials, welding materials, packaging materials and other auxiliary materials along with the goods) are in compliance with EU RoHS regulations 2011/65/EU. The following table is the allowable content of each harmful substance.

NO.	名称 Name	限值要求 Allowable Concentration
1	铅 Pb	0.1% (1000ppm)
2	汞 Hg	0.1% (1000ppm)
3	镉 Cd	0.01% (100ppm)
4	六价铬 Cr(VI)	0.1% (1000ppm)
5	多溴联苯 PBB	0.1% (1000ppm)
6	多溴联苯醚 PBDE	0.1% (1000ppm)
7	邻苯二甲酸二异丁酯 DIBP	0.1% (1000ppm)
8	邻苯二甲酸(2-乙基)己酯 DEHP	0.1% (1000ppm)
9	邻苯二甲酸二丁酯 DBP	0.1% (1000ppm)
10	邻苯二甲酸丁苄酯 BBP	0.1% (1000ppm)