

# Carli®

Customer: 立创

No: MPXG190122A

STN001.2 Edt:G



## Capacitors



品名: 抑制电源电磁干扰用X2聚丙烯薄膜电容器  
(Description) Metallized Polypropylene Film Interference Suppression Capacitor (Class - X2)

型式: MPX (Code 代号 PX)

零件料号: PX333K2WB29H200D9R  
(Part No.) PX104K2WC39H200D9R, PX684K2WD69H200D9R

客户料号:  
(Customer Part No)

日期: 2019.01.22  
(Date)

承认章 (Approved By)



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## 承认书修订履历表

### UPDATE HISTORY

客户 (Customer)	立 创		承认书编号 (SPEC NO)	MPXG190122A
NO	Date	Edition	Histroy	
1	2019.01.22	A	新制订承认书编号: MPXG190122A	
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2019-1-22

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# General Information

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## 0: Product Code System 产品代码系统

For example: The part number, comprising 18 digits, is formed as follows.

举例: 产品料号由18位数字组成, 如下:

P	X	1	0	4	K	2	W	C	3	9	H	2	0	0	D	9	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

- |                                     |   |
|-------------------------------------|---|
| Digit 1~2: Type Code                | Digit 11 and 17: Type Series Code         |
| 数位1~2: 型号代码                         | 数位11和17: 型号系列码                            |
| Digit 3~5: Capacitance Value Code   | Digit 12: Lead Form Code                  |
| 数位 3~5: 容值代码                        | 数位 12: 引线加工型式代码                           |
| Digit 6: Capacitance Tolerance Code | Digit 13~15: Lead Length Code             |
| 数位 6: 容量偏差代码                        | 数位 13~15: 引线长度码                           |
| Digit 7~8: Rated Voltage Code       | Digit 16: Lead Length Tolerance Code      |
| 数位 7~8: 额定电压代码                      | 数位 16: 引线长误差代码                            |
| Digit 9~10: Case or Pitch Code      | Digit 18: RoHs or HF Compliance Type Code |
| 数位 9~10: 壳体或脚距代码                    | 数位 18: RoHs或HF符合性代码                       |

### 0.1 Digit 1 to 2 - 数位1~2: TYPE code. 型号代码

TYPE型号	MPX	MPF	MPH	MPB	MPV	MPC	PPS	PPN	DPS	DPC	DMB
CODE代码	PX	PF	PH	PB	PV	PC	DF	NF	DS	DC	DB

TYPE型号	MEF	MTF	MEH	MEC	MSC	MSF	MTB	MEV
CODE代码	AF	TF	AH	AC	SC	SF	TB	AV

### 0.2 Digit 3 to 5 - 数位3~5: Capacitance Expressed in 3-digit code 3位数字代码表示容值

The first 2 digits indicate significant figures, and the third digit specifies the number of zero to follow.  
前两位表示基数, 第三个数字表示其后零的个数

This gives the capacitance in picofarads. 容量值单位为皮法

For examples 举例:

$$102 = 10 \times 10^2 \text{ pF} = 1,000 \text{ pF} = 1.0 \text{ nF} = 0.001 \mu\text{F} \quad 105 = 10 \times 10^5 \text{ pF} = 1,000,000 \text{ pF} = 1000 \text{ nF} = 1 \mu\text{F}$$

### 0.3 Digit 6 - 数位6 Capacitance tolerance 容量偏差

Tolerance	±1%	±2%	±3%	±5%	±10%	±20%
CODE	F	G	H	J	K	M

### 0.4 Digit 7 to 8 - 数位7~8: Rated Voltage 额定电压:

VR(DC)	50	63	100	160	250	400	450	500	630	800	1000	1250	1600	2000	2500
CODE	1H	1J	2A	2C	2E	2G	2Y	2H	2J	2K	3A	3V	3C	3D	3E
VR(AC)	125	140	150	160	220	250	275	310	350	400	440	450	500	600	630
CODE	2L	4B	2S	2U	2P	2I	3I	2W	2F	2R	4A	2T	2M	2Z	3J

### 0.5 Digit 9 to 10 - 数位9~10: Pitch expressed by Case No or two digits 表示壳体或两个数字的脚距代码

Box type 盒装型

Pitch脚距	7.5	10	12.5	15	20	22.5	27.5	37.5	42.5	55
Case No 壳体代码	B*	C*	G*	D*	S*	E*	F*	J*	K*	P*



Powder Coating type 粉涂型

Pitch脚距	7.5	10	15	20	22.5	27.5
Code代码	07	10	15	20	22	27

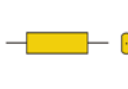
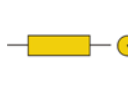
### 0.6 Digit 11 and 17 - 数位11和数位17 series code 系列代码:

### 0.7 Digit 12 - 数位12 Lead Form 引线加工型式代码






Box type 盒装型

Code 代码	L	H
Lead Type 形式		

Axial Type 轴向型

Code 代码	L	L
Lead Type 形式		

Powder Coating type 粉涂型

Code 代码	L	H	K	N	M
Lead Type 形式					

### 0.8 Digit 13 to 15 - 数位13~15: Lead Length (Straight): Expressed in 3-letter code 引线长度以3个数字代码表示

example 举例: code 代码200 = 200/10=20 (mm),

### 0.9 Digit 16 - 数位16: Tolerance of Lead Length (Straight) 引线长度(直型)偏差: Expressed in 1-letter 1个字母表示

Tolerance	±0.3 mm	±0.5 mm	+0.5/-0mm	±1mm	±2mm	±0.4mm
Code	A	B	C	D	E	F

### 0.10 Digit 18 - 数位18 "H" Halogen-Free compliant, 无卤型 "R" ROHS compliant. ROHS符合型

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## Specification for Metallized Polypropylene Film Interference Suppression Capacitor Class - X2 , MPX type

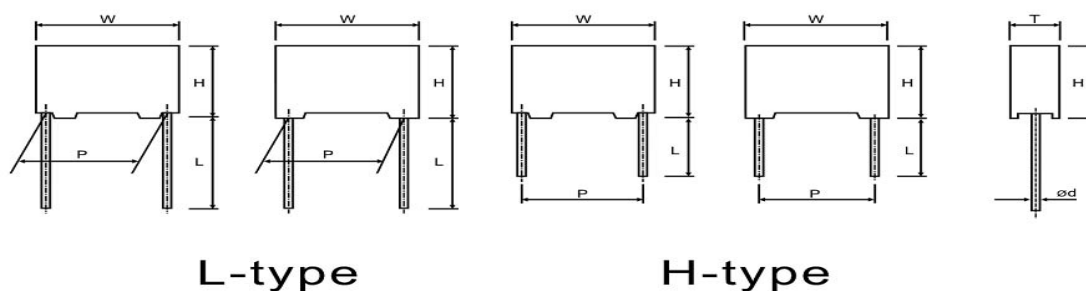
### 抑制电源电磁干扰用X2金属化聚丙烯膜电容器规格说明 ,MPX

#### 1.Scope 范围 .

This specification applies to metallized polypropylene film capacitors type name MPX (code PX) ,  
used in electromagnetic interference suppression or across-the- line capacitor .

此规范应用于抑制电磁干扰的金属化聚丙烯膜电容器,型号MPX(代码PX).

#### 2. Dimension sheet 规格尺寸



NO	CARLI P/N	CAP ( $\mu$ F)	TOL $\pm$ %	R.V VAC	DF (1KHz) $\leq$ %	DIMENSIONS 尺寸 (mm)						FIG	CUSTOMER 客户 P/N 料号
						W ( $\pm$ 0.5)	H ( $\pm$ 0.5)	T ( $\pm$ 0.5)	P $\pm$ 1	L $\pm$ 1	$\phi$ d $\pm$ 0.05		
1	PX333K2WB29H200D9R	.033	10	310	0.1	10.5	10	4	7.5	20	0.6	H	
2	PX104K2WC39H200D9R	.1	10	310	0.1	13	12	6	10	20	0.6	H	
3	PX684K2WD69H200D9R	.68	10	310	0.1	18	18.5	11	15	20	0.8	H	
4													
5													
6													
7													
8													
9													
10													

NOTE

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林乔伟

2019-1-22

## Specification for Metallized Polypropylene Film Interference Suppression Capacitor Class - X2 , MPX type

### 抑制电源电磁干扰用X2金属化聚丙烯膜电容器规格说明 ,MPX

#### 3. Type Introduction And Applications 型号介绍及用途:

Depending on the way they are connected ,two principal classes of capacitors have been defined for fixed capacitors for electromagnetic interference suppression and connection to the supply mains ,Class X and Y .  
按照连接方式不同,抑制电源电磁干扰用固定电容器分为两大类:X类和Y类.

##### ● CLASS"X"Capacitors - X类电容器

X capacitors which are connected between the line phases are effective against symmetrical interference (differential mode) . A type is suitable for use in situations where failure of the capacitor would not lead to danger of electrical shock . Class X capacitor are divided into three subclasses X1,X2,X3.

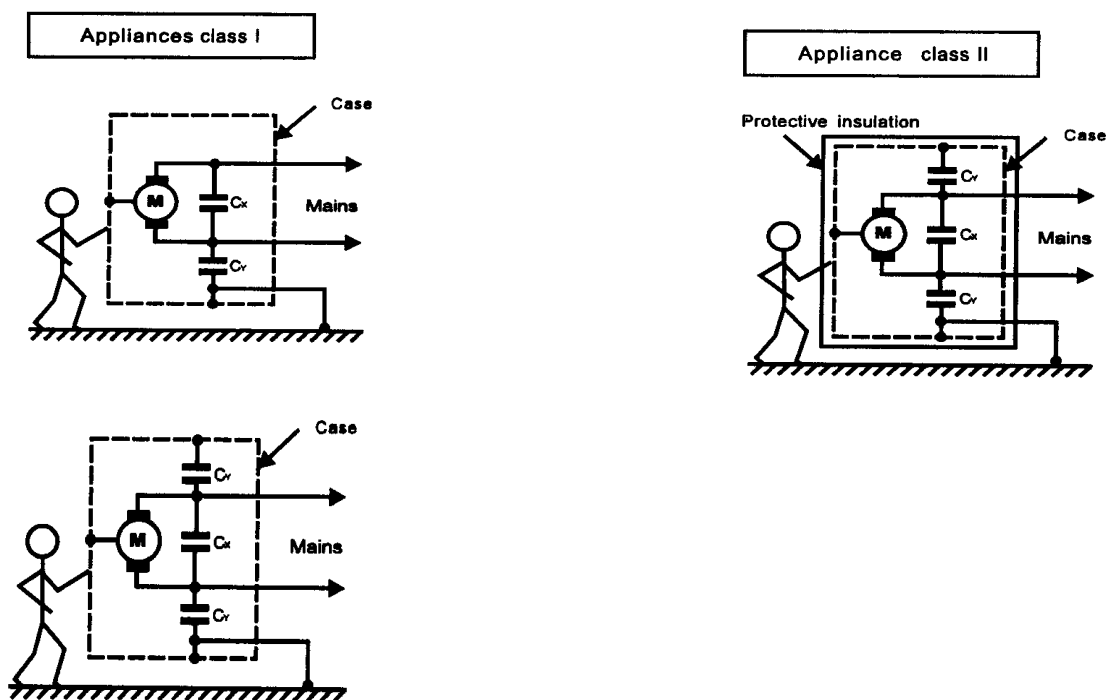
X类电容器连接于两相线间,消除对称干扰(差模),适用于在电容器失效时不会导致电击危险的场合,分为三个等级:X1、X2、X3 .

##### ● CLASS"Y" Capacitors -Y 类电容器

Y capacitors which are connected between a phase and neutral (zero potential ) are effective against asymmetrical interference (common mode) . A type is suitable for use in situations where failure of the capacitor could lead to danger of electric shock .

Class Y capacitor are divided into four subclasses Y1,Y2,Y3,Y4.

Y类电容器连接于相线对中位相间(零相),消除不对称干扰(共模).适用于在电容器失效时会导致电击危险的场合.Y类电容器分为Y1、Y2、Y3、Y4.



Cx: Suppression capacitors-Function (or class) X -X 电容

Cy: Suppression capacitors-Function (or class) Y -Y电容

The examples above show protection and suppression of a motor by using X and Y capacitors.

上图显示采用了X电容和Y电容保护的马达电路.

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## Specification for Metallized Polypropylene Film Interference Suppression Capacitor Class - X2 , MPX type

### 抑制电源电磁干扰用X2金属化聚丙烯膜电容器规格说明 ,MPX

#### 3.1 Type introduction and application - 型号介绍及用途:

3.1.1 MPX are wined with metallized polypropylene film dielectric, non-inductive construction, CP wire and encapsulated in plastic case with flame retardant epoxy resin sealed. They have excellent features of self-healing and good flame retardant according to UL 94V-0 .

MPX 电容是由金属化聚丙烯膜无感结构卷绕而成,采用镀锡CP导线,塑胶壳体以及阻燃环氧树脂封装而成,它们有自我修复的优良特性和优良的阻燃性,符合UL 94V-0 标准.

#### 3.1.2 Type application:

Interference suppression and across-the-line capacitor applications.

Suitable for used in situations where failure of the capacitor will not lead to danger of electric shock.

用途: 干扰抑制器和跨线电容器应用.适用于使用的电容器失效后不会导致触电的危险的场合.

Remark: X2products can not be used in three-phase alternating current series circuit.

备注:X2产品不可用于三相交流电串联电路中.

#### 4. Features - 特点:

- 4.1 Non-induction construction - 无感结构;
- 4.2 High moisture-resistance - 优良的耐湿性;
- 4.3 Self-healing property - 自愈性 ;
- 4.4 Flame retardant type (compliance with UL 94V-0) - 阻燃型 (符合UL 94V-0) ;

#### 5. Electrical specifications- 电气特性

Unless otherwise specified, electric characteristics shall refer to IEC 60384-14, EN 60384-14.

如无其他说明,电气特性请参考IEC 60384-14,EN 60384-14 .

Item	Specification
Climatic Category 气候类别 Passive Flammability Class 阻燃等级	40/100/56/B
Operating Temperature 工作温度	-40℃ ~ +100℃
Capacitance Range 容量范围	0.01μF~10μF
Capacitance Tolerance 容量偏差	±10%(K), ±20%(M)
Rated Voltage 额定电压	310VAC
Dissipation Factor 散逸因素	≦0.1% (1KHz at 25±5℃)
Insulation Resistance 绝缘电阻	≧ 15000MΩ for C ≦0.33μF; ≧ 5000MΩ·μF for C>0.33μF (Measured at 100 ±10VDC/60s/25±5℃)
Withstand Voltage Between Terminals 端子间耐压	1333VDC / 1min, no breakdown or flashover. (Voltage raising time 5~10sec,cut off current 10mA, ARC=OFF) 施加测试电压1333VDC / 1分钟, 无击穿或电弧. (电压上升时间 5~10sec,漏电流10mA, ARC=OFF)
Withstand Voltage Between Terminals And Case 端子与壳体间耐压	2120VAC / 1min, no breakdown or flashover. 施加测试电压2120VAC / 1分钟, 无击穿或电弧.

Note : Rated voltage is defined the voltage which shall be capable of applying to capacitors continuously in the operating temperature range. Please do not place the capacitors in more than the rated operating temperature environment in the long-term work .

It can reduces the capacitor's life or cause an electric shock hazard .

额定电压定义：在工作温度范围内,电容持续运行的可承受电压.

请不要将电容置于超过额定温度环境中长期工作,会降低使用寿命或发生电击危险.

6. Marking:



Normal type  
(常规型)

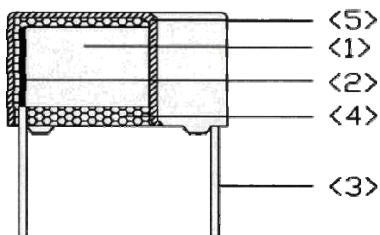


Halogen Free-type  
(无卤型)

NO.	ITEM	EXPLAIN
1		CARLI LOGO 凯励公司LOGO
2	.1K	Capacitance and tolerance 容值与偏差: .1=0.1μF, K=±10%
3	310V~	Rated voltage 额定电压: 310VAC
4	X2	Class 电容类别 : X2类
5	CARLI	Manufacture's trademark code 制造商标: CARLI
6	MPX	Product type 产品型号 : MPX
7	40/100/56/B	Climatic category 气候类别 : 40/100/56 94V-0: B级
8	HF	Halogen Free 无卤
9		Safety approval 安规认证

7. Construction and main materials of products 产品结构和主材

MPX TYPE:



Main Materials

NO.	Main Materials 主要材料	Specification	Note
1	Metallized Polypropylene Film 金属化聚丙烯膜	MPPHE	-/-
2	Solder 焊料	Sn-based alloy 锡基合金	-/-
3	Terminal 引线	CP wire 镀锡铜包钢线 ( Ø0.8 or 0.6mm)	-/-
4	Sealed Material 封装材料	Epoxy resin 环氧树脂	UL94V-0
5	Plastic Case 塑胶壳体	PBT	UL94V-0

Note : All of the materials and the finished products are all in compliance with the requirements of RoHS.



## 8. Packing 包装说明:

Package bag and Carton 包装袋与纸箱



交货明细表				
规格	型式	包数	数量	

(Normal Product)  
常规品

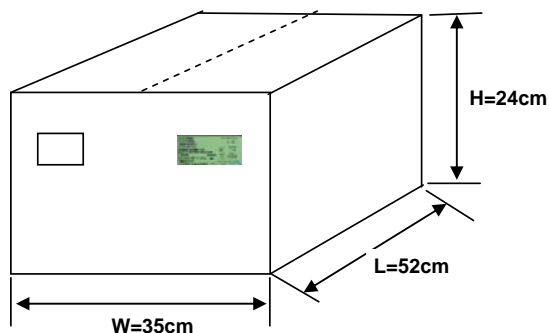


环保无卤HF 交货明细表				
规格	型式	包数	数量	

(Halogen Free Product)  
无卤品



凯励电子股份有限公司 CARLI ELECTRONICS CO.,LTD		
ORDER NO.		
Cap	TOLERANCE	W.V
	±%	
P/N	QUANTITY	DATE
	PCS	



8.1 Carton size 纸箱尺寸: L\*W\*H(长\*宽\*高)=52\*35\*24 cm .

8.2 The detail of the carton 纸箱包装说明 :

8.2.1 Packing list card, including 装箱明细, 包括:

Part number of manufacturer. 制造商料号;

Total quantity of bags and unit . 包数及每包数量,lot No批号;

8.2.2 Marking or table for RoHS . RoHS 标识;

8.2.3 Other marking customer required . 其他客户要求标识.

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**9. Storage conditions 存储条件:**

9.1 It should be noted that the solderability of the terminals may be deteriorated when

Stored barely in an atmosphere for a long periods .

请注意,长时间暴露在空气中会导致引线焊接性能衰减.

9.2 It shouldn't be located in particularly high temperature and high humidity ,it must

Submit to the following conditions( keeping in the original package):

不能放置在高温和高湿环境中,请遵循以下存储条件 (原包装下保存)

Temperature 温度: 35°C MAX.

Relative humidity 相对湿度: 85% MAX.

9.3 Storage period: Loose :12 months max.

存储时间: 最长12个月.

**10. Origin , including产地:**

10.1 CHINA P.R.C 中国.

10.2 TAIWAN R.O.C 中国台湾.

**11. The compliance with enviroment requirement 环保要求符合性**

11.1 Compliance with the requirement of RoHS. 符合RoHS要求;

11.2 Compliance with the requirement of REACH 符合REACH 要求;

11.3 Without Halogen ( as required ) 符合无卤 (如要求) ;

**12. Characteristics and test conditions 电气特性和测试条件**

Test condition: Unless otherwise specified, the standard range of atmospheric

Conditions for marking measurements and test is as follows Ambient .

测试条件:除非另外说明,则在大气标准范围内测试,条件如下:

Temperature 环境温度: 15~35 °C,

Relative humidity 相对湿度: 25~75%.

If there may be any doubt on the results, measurements shall be made within the

Following limits.

如对测试结果有任何疑问, 则按以下限制测试:

Ambient temperature 环境温度: 20±2°C , Relative humidity 相对湿度: 60~70%.

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## 12.1 Characteristics: MPX-TYPE

NO.	Item 项目	Characteristics 特性	Test method 试验方法
1	Capacitance Range 容量范围	0.01 $\mu$ F~10 $\mu$ F	Measure at 1KHz ( 25 $\pm$ 5 $^{\circ}$ C) IEC60384-14 C4.2.2 IEC 60384-1 C4.7
2	Capacitance Tolerance 容量偏差	Within specified tolerance 规定范围内偏差 K: $\pm$ 10%; M: $\pm$ 20%	Measure at 1KHz ( 25 $\pm$ 5 $^{\circ}$ C) IEC60384-14 C4.2.2 IEC 60384-1 C4.7
3	Dissipation Factor 散逸因素	$\leq$ 0.1%	Measure at 1KHz ( 25 $\pm$ 5 $^{\circ}$ C) IEC60384-14 C4.2.3 IEC 60384-1 C4.8
4	Rated Voltage 额定电压	310VAC 50/60HZ	UL60384-14 IEC60384-14
5	Withstand Voltage 耐电压	Between Terminals 端子间	No abnormality无异常
			1333VDC for 1 min IEC 60384-14 C4.2.1 IEC60384-1 C4.6 (Voltage increasing time 5~10sec, Cut off current 10mA,ARC=OFF). 端子间施加1333VDC / 1 min (电压爬升时间: 5~10sec, 漏电流 10mA, ARC=OFF)
6	Insulation Resistance 绝缘电阻	$\geq$ 15000M $\Omega$ for C $\leq$ 0.33 $\mu$ F $\geq$ 5000M $\Omega$ · $\mu$ F for C>0.33 $\mu$ F	Charge time 充电时间: 60 $\pm$ 5sec Charge voltage 充电电压: 100VDC Test temp 温度: 25 $\pm$ 5 $^{\circ}$ C IEC60384-14 C4.2.5 IEC60384-1-4.5
7	Terminal Strength 端子强度	Pull Strength 拉伸强度	There shall be no such mechanical 无可见机械损伤
		Bending Strength 弯曲强度	
			Wire diameter 线径:0.6 & 0.8mm Load 荷重: 10N, time 时间:10sec IEC60384-14 C4.3 (IEC60384-1 C4.13) IEC 60068 2-21 Test Ua1
			Wire diameter 线径:0.6 & 0.8mm Load 荷重: 5N, 90 $^{\circ}$ $\times$ 4times次 IEC60384-14 C4.3 (IEC 60384-1 C4.13) IEC60068 2-21 Test Ua1
8	Solderability 焊锡附着性	At least 95% of the Circumference of the lead wire. Around load surface dipped Into with new solder 焊锡覆盖面积必须达浸沾表面积95%以上	Solder temp 焊锡温度: 245 $\pm$ 5 $^{\circ}$ C Immersion time 浸入时间: 2.5 $\pm$ 0.5sec IEC60384-14-4.5 (IEC 60384-1-4.15) IEC 60068 2-20 Test Ta
9	Cold Resistance 耐寒性	Appearance 外观	No abnormality
		Capacitance Variation 容量变化	
		Within $\Delta$ C/C $\pm$ 2.0% of the value Before test	Temp 温度:-40+8/-0 $^{\circ}$ C Duration 持续时间: 2+1/-0hours Then recovery at ordinary Condition 1~2 hours 恢复时间1~ 2 小时 IEC60384-14 C4.11.4 IEC 60068 2-1 Test Ta

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## 12.1 Characteristics:MPX-TYPE

NO.	Item 项目	Characteristics 特性	Test method 试验方法	
10	Resistance to Soldering heat 焊接耐热性	Appearance 外观	Solder temp 焊锡温度:260±5℃ Immersion time 浸入时间:10±1sec  Then recovery at ordinary Condition 1~ 2 hours 恢复时间1~ 2 小时  IEC60384-14 C4.5 (IEC 60384-1 C4.15) IEC 60068-2-20 Test Ta	
		Withstand Voltage 耐电压		No visible damage 无可见损伤  1333VDC / 1min No abnormality 无损伤
		Capacitance Variation 容量变化		$\Delta C/C \leq \pm 5\%$
11	Damp heat, Steady state 稳态湿热	Appearance 外观	Humidity 相对湿度:90-95% Temp 温度:40±2℃ Duration 持续时间: 56 day  Then recovery at ordinary condition 1~2 hours 恢复时间1~ 2 小时  IEC60384-14 C4.12 (IEC60384-1 C4.22) IEC60068 2-3 Test Ca	
		Capacitance Variation 容量变化		$\Delta C/C \leq \pm 5\%$
		Dissipation Factor 散逸因素		$\leq 0.2\% \quad 1\text{KHz}$
		Withstand Voltage 耐电压		1333VDC / 1min No abnormality 无损伤
		Insulation Resistance 绝缘电阻		$\Delta IR/IR \leq 50\%$
12	Endurance test 耐久性试验	Appearance 外观	AC voltage of 125% of rated Voltage shall be applied to the Capacitor for 1000+48/0 h Through serial resistor of 20 to 1000Ω per 1V at the test Temperature of 100 ± 2℃.  施加125%额定交流电压 1000+48/0 h, 连接串联电阻 20到1000Ω/伏特,试验温度100 ± 2℃.  IEC60384-14 C4.14	
		Capacitance Variation 容量变化		$\Delta C/C \leq \pm 10\%$
		Dissipation Factor 散逸因素		$\leq 0.5\% \quad 1\text{KHz}$
		Withstand Voltage 耐电压		1333VDC / 1min No abnormality 无损伤
		Insulation Resistance 绝缘阻抗		$\Delta IR/IR \leq 50\%$

## 13. Regulation in useage - 使用规则

2019-1-22

### 13.1 Soldering suggestions - 焊接的建议

When soldering a capacitor, heat in soldering is conducted to the element of the capacitor from wire lead and an enclosure, and hence it should be noted that soldering under high temperature and a long period may cause deterioration of breakdown of capacitors. characteristic or Be sure to solder within the following temperature condition range.

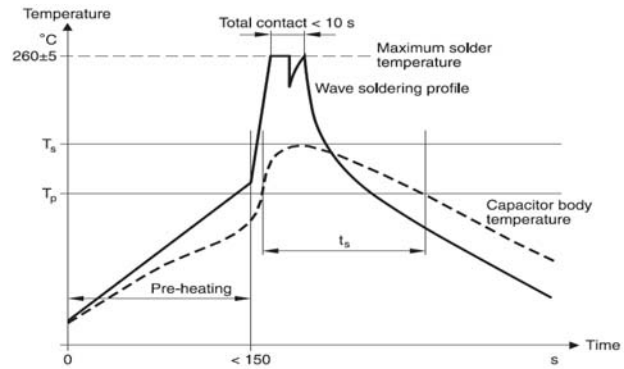
当焊接电容器时,焊锡热会通过引线端子高温和封装层传递到电容器素子,因此必须注意高温和长时间焊接引起的电容器特性衰减或损坏,请确认焊锡在以下温度范围内。

$T_s$  : Capacitor body maximum temperature at wave soldering

波峰焊电容器体最高温度

$T_p$  : Capacitor body maximum temperature at pre-heating

预热前电容器体最高温度



**Body temperature should follow the description below:**

电容器体温度应该符合以下描述

#### MPP电容器

During pre-heating:  $T_p \leq 110^\circ\text{C}$

During soldering:  $T_s \leq 120^\circ\text{C}$ ,  $t_s \leq 45\text{s}$

加热温度:  $T_p \leq 110^\circ\text{C}$

焊接温度:  $T_s \leq 120^\circ\text{C}$ ,  $t_s \leq 45\text{s}$

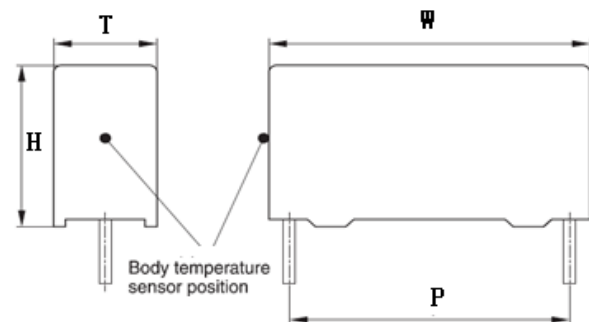
#### MPE电容器

During pre-heating:  $T_p \leq 125^\circ\text{C}$

During soldering:  $T_s \leq 160^\circ\text{C}$ ,  $t_s \leq 45\text{s}$

加热温度:  $T_p \leq 125^\circ\text{C}$

焊接温度:  $T_s \leq 160^\circ\text{C}$ ,  $t_s \leq 45\text{s}$



■ When SMD components are used together with leaded ones, the film capacitors should not pass into the SMD adhesive curing oven. The leaded components should be assembled after the SMD curing step.

当SMD元件与引脚式元件一起使用时,薄膜电容器不应进入SMD粘合剂固化炉。引脚式部件应在SMD固化步骤之后组装。

■ Leaded film capacitors are not suitable for reflow soldering.

引脚式薄膜电容器不适合回流焊

■ In order to ensure proper conditions for manual or selective soldering, the body temperature of the capacitor ( $T_s$ ) must be  $\leq 120^\circ\text{C}$ .

为了确保手动或选择性焊接的适当条件,电容器( $T_s$ )的本体温度必须是  $\leq 120^\circ\text{C}$ 。

■ One recommended condition for manual soldering is that the tip of the soldering iron should be  $< 360^\circ\text{C}$  and the soldering contact time should be no longer than 3 seconds.

手工焊接的一个推荐条件是烙铁的顶端应该是  $< 360^\circ\text{C}$ , 焊接接触时间不应超过3秒。

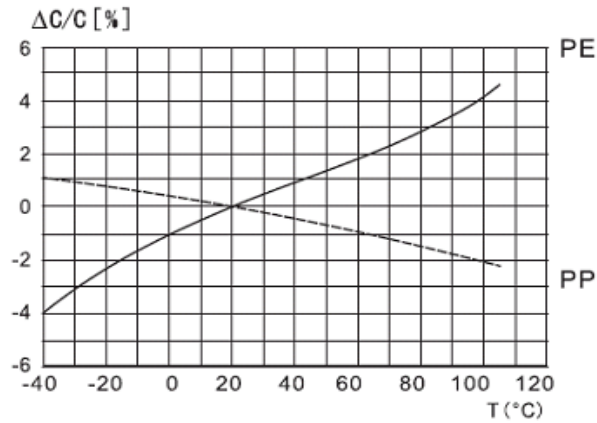
■ For uncoated MPE capacitors with lead spacings  $\leq 10\text{mm}$  the following measures are recommended:

未涂覆的MPE电容器引线间隔为  $\leq 10$ 毫米,建议采取以下措施

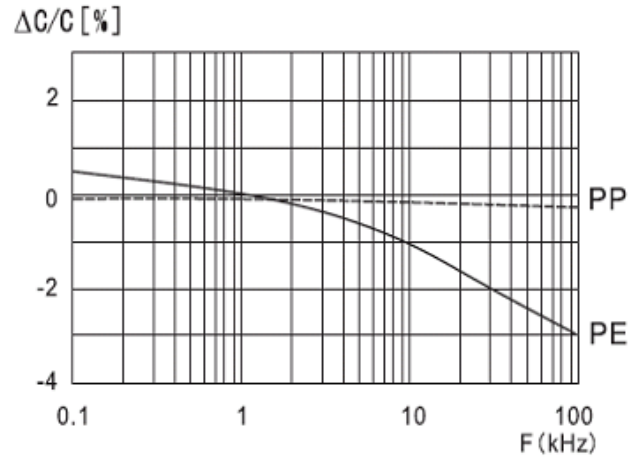
1. pre-heating to noe more than  $110^\circ\text{C}$  in the preheater phase 预热前预热期不超过  $110^\circ\text{C}$

2. rapid cooling after soldering 焊后快速冷却

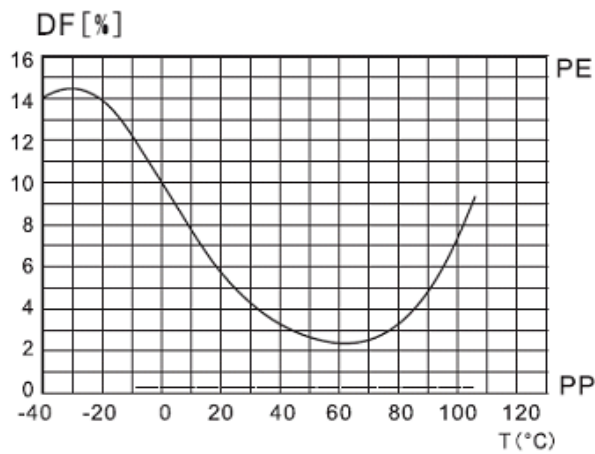
14. Product electrical characteristic graph 产品电气特性图



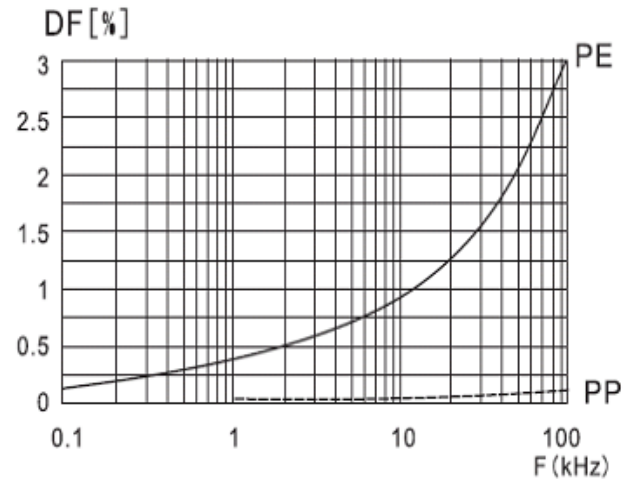
Capacitance vs. temperature at 1kHz



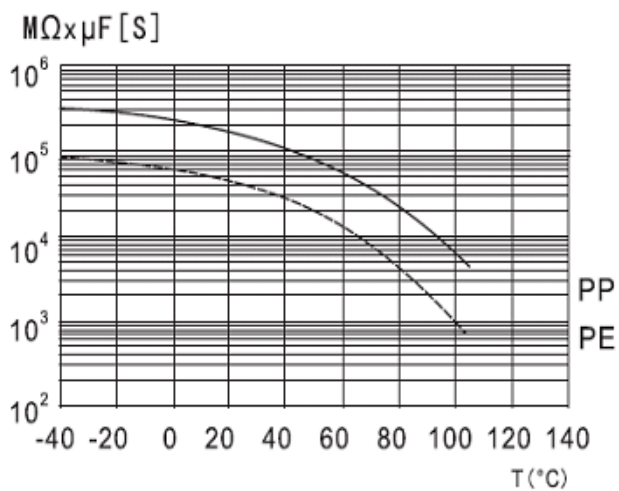
Capacitance vs. frequency (Room temperature)



Dissipation factor vs. temperature at 1kHz



Dissipation factor vs. frequency (Room temperature)



I.R. vs. temperature

----- 聚丙烯膜 ( Polypropylene Film )  
 ————— 聚脂薄膜 ( Polyester Film )