广东风华高新科技股份有限公司

FENGHUA ADVANCED TECHNOLOGY（HOLDING）CO.，LTD

承　　认　　书

APPROVAL　SHEET

客户名称: _____

CUSTOMER

品　　名: 厚膜片式电阻器

PARTNAME THICK FILM CHIP RESISTOR

规　　格:

SPECIFICATION

RC02□ * * *

RC03□ * * */ RS03□ * * *

RC05□ * * */ RS05□ * * *

RC06□ * * */ RS06□ * * *

RC10□ * * */ RS10□ * * *

RC12□ * * *

版 本 号: R-5.0

VERSION

日　　期: _____

DATE

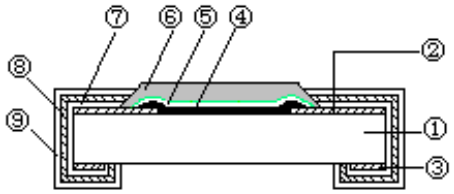
制 造			客 户		
APPROVAL			APPROVAL		
拟制	审核	批准	检验	审核	批准

注：本版号承认书自 2002 年 11 月 15 日起实施，之前所有版号同时废止。

This version is in effect from Nov.15, 2002 ,and the previous version is invalid.

序号 No	目　　录 TABLE　OF　CONTENTS
1.0	形状尺寸图 Dimensions and Construction
2.0	负荷下降曲线 Power Deratting Curve
3.0	额定值 Ratings
4.0	产品命名表示方法 Explanation of Part Numbers
5.0	IEC-24、96 系列电阻值对照表 IEC-24、96 Series Resistance
6.0	电阻标记表示方法 Resistance Value Marking
7.0	产品外观 Appearance & Construction
8.0	电气性能 Performance Specification
9.0	机械性能 Mechanical Characteristic
10.0	耐气候性能 Environment Test
11.0	编带包装说明 Explanation of Taping and Packing
12.0	塑料盒包装说明 Bulk Case
13.0	贮存方法 Storage Methods

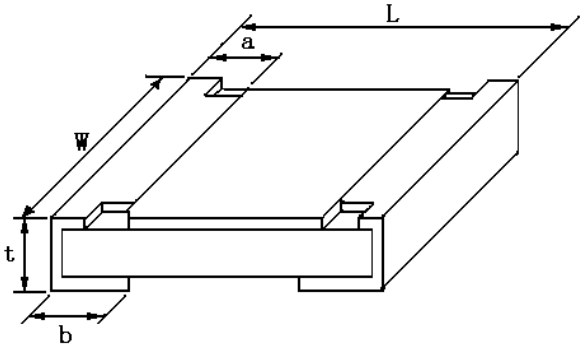
1.0 产品形状尺寸图 Dimension and Construction



①陶瓷基片 Substrate	三氧化二铝 Al_2O_3
②面电极 Face Electrode	银一钯电极 Ag/Pd
③背电极 Reverse Electrode	银一钯电极 Ag/Pd
④电阻体 Resistive Element	氧化钌 Ruthenium
⑤一次玻璃体 1st Cover Glass	玻璃釉 Glass
⑥二次玻璃体 2nd Cover Glass	玻璃釉 Glass
⑦端电极 Termination	银电极 Ag
⑧中间电极 Between Termination	镍层 Ni Plating
⑨外部电极 Outer Termination	锡铅层或*锡层 Sn/Pb Plating or Sn Plating

*备注：采用无铅材料进行表面处理，可使片阻的端头部分不含铅，适用于无铅焊接。

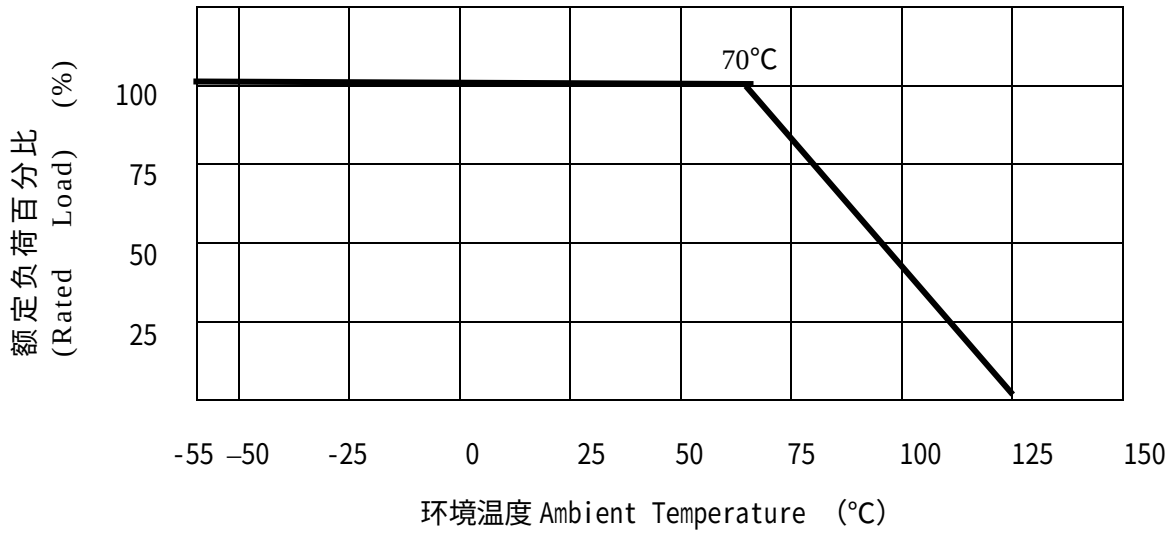
Remark：if using lead-free material for surface treatment， can make the termination to be lead-free and applicable for lead-free soldering。



型号 Type	L (mm)	W (mm)	t (mm)	a (mm)	b (mm)
0402	1.00±0.10	0.50±0.10	0.30±0.10	0.20±0.10	0.25±0.10
0603	1.60±0.15	0.80±0.15	0.40±0.10	0.30±0.20	0.30±0.20
0805	2.00±0.20	1.25±0.15	0.50±0.10	0.40±0.20	0.40±0.20
1206	3.20±0.20	1.60±0.15	0.60±0.10	0.50±0.20	0.50±0.20
2010	5.00±0.20	2.50±0.20	0.60±0.10	0.60±0.20	0.60±0.20
2512	6.40±0.20	3.20±0.20	0.60±0.10	1.00±0.20	1.00±0.20

2.0 负荷下降曲线 Power Derating Curve

使用温度范围
Temperature
Range of Use
-55℃～+125℃



3.0 额定值 rating

项 目 Item	规 格 specification						
额定功率 Rated Power	型 号 Type	0402	0603	0805	1206	2010	2512
	常规功率 normal power (70℃)	1/16W	1/16W	1/10W	1/8W	1/2W	1W
	特殊功率 special power (70℃)	/	1/10W	1/8W	1/4W	3/4W	/
	注：当使用环境温度超过 70℃时应按 2.0 降负荷 Remark: When used at ambient temperature over 70℃ the load power should be reduced as the description of 2.0.						

额定电压及使用最大工作电压 Rated Voltage & Max. Voltage Used

每一阻值额定电压根据下列公式计算出，当计算出的额定电压超过表中使用最大工作电压时，所使用的额定电压应为表中最大工作电压。The rated voltage at each resistance should be calculated. From the equation below , and when the rated voltage exceeds the maximum voltage used shown in the table, the rated voltage used should be the maximum voltage.

$E=\sqrt{P\times R}$

E：额定电压 Rated Voltage (V)
R：标称阻值 Normal Resistance (Ω)
P：额定功耗 Rated Power (W)

型 号 Type	使用最大工作电压 Max Voltage Used
0402	50V
0603	50V
0805	(RC05) 100V/ (RS05) 150V
1206	200V
2010	200V
2512	200V

续上页 Continue

项 目 Item	规 格 specification					
最大过负载电压 Max. Overload Voltage	最大过负荷电压为：2.5 倍额定电压(2.5×E) 当计算出的电压值超过下表中最大过负荷电压时,按下表： The Max. Overload Voltage should be 2.5×E, When the Voltage exceeds the maximum overload voltage in the table below. the value shown in the table should be the maximum one.					
	0402	0603	0805	1206	2010	2512
	100V	100V	RC05：200V RS05：300V	400V	400V	400V
跨接电阻额定电流 rated current for chip jumper	0402	0603	0805	1206	2010	2512
	1A	1A	2A	2A	2A	2A
电 阻 公 差 Tolerance for Resistor	代 号 code	F	G	J	K	J（跨接电阻） Chip Jumper
	电阻值误差 Resistor Tolerance	±1%	±2%	±5%	±10%	≤50mΩ
阻值范围 Range of Resistance for Manufacture	型 号 Type	阻值范围 Resistance Range			系 列 Series	
	0402	0Ω（跨接电阻 Chip Jumper） 1Ω～10MΩ			E-24 E-96	
	0603	0Ω（跨接电阻 Chip Jumper） 1Ω～10MΩ				
	0805					
	1206					
	2010					
	2512					
使用温度范围 Temperature Range of Use	-55~+125℃					
额定温度 Rated Temperature	+70℃					

4.0 产品命名表示方法 Explanation of Part Numbers

电阻温度系数代号 Resistance Temperature Coefficient code	
0603 0805 1206 2010 2512	K：±100PPM/°C L：±250PPM/°C M：±500PPM/°C
0402	U：±400PPM/°C W：±200PPM/°C
跨接电阻 chip jumper	无表示 no marking

包装方式代号 packing style	
T	编带 Tape & Reel
B	塑料盒装 Bulk Case
C	散袋装 Bulk

额定功率系列代号 power rating series	
C	常规功率系列 normal power series
S	特殊功率系列 special power series

R	C	0	5	K	1	0	0	2	F	T

产品代号 product code	
R	片式电阻器 chip resistor

型号代号 type code			
代号 code	型号 Type	额定功率 power	
		常规 normal	特殊 special
02	0402	1/16W	/
03	0603	1/16W	1/10W
05	0805	1/10W	1/8W
06	1206	1/8W	1/4W
10	2010	1/2 W	3/4 W
12	2512	1 W	/

电阻值代号 resistance value
具体见 5.0 & 6.0 see the description of 5.0 & 6.0 for detail

电阻公差代号 tolerance	
F	±1%
G	±2%
J	±5%
K	±10%
J(跨接电阻) Chip Jumper	≤50mΩ

5.0 IEC E-24、E-96 系列电阻值对照表
IEC E-24、E-96 Series Resistance Cross-reference List

E-24 系列(E-24 series)

(×10^nΩ)

(单位 unit：1Ω、10Ω、100Ω、1KΩ、10KΩ、100KΩ、1MΩ)

表 一(table one)

1.0	1.5	2.2	3.3	4.7	6.8
1.1	1.6	2.4	3.6	5.1	7.5
1.2	1.8	2.7	3.9	5.6	8.2
1.3	2.0	3.0	4.3	6.2	9.1

E-96 系列(E-96 series)

(×10^nΩ)

(单位：1Ω、10Ω、100Ω、1KΩ、10KΩ、100KΩ、1MΩ)

表 二(table two)

1.00	1.33	1.78	2.37	3.16	4.22	5.62	7.50
1.02	1.37	1.82	2.43	3.24	4.32	5.76	7.68
1.05	1.40	1.87	2.49	3.32	4.42	5.90	7.87
1.07	1.43	1.91	2.55	3.40	4.53	6.04	8.06
1.10	1.47	1.96	2.61	3.48	4.64	6.19	8.25
1.13	1.50	2.00	2.67	3.57	4.75	6.34	8.45
1.15	1.54	2.05	2.74	3.65	4.87	6.49	8.66
1.18	1.58	2.10	2.80	3.74	4.99	6.65	8.87
1.21	1.62	2.15	2.87	3.83	5.11	6.81	9.09
1.24	1.65	2.21	2.94	3.92	5.23	6.98	9.31
1.27	1.69	2.26	3.01	4.02	5.36	7.15	9.53
1.30	1.74	2.32	3.09	4.12	5.49	7.32	9.76

6.0 标记表示方法 the explanation for the resistance value marking

☆E-24 系列：采用三位数字表示，前二位表示电阻值有效数字，第三位表示乘以 10 的次方数
E-24series: express resistance value on the glass side with three digits, the first tow digits should be significant and the third one denote number of zeros.

例 for example：

→ 10KΩ

☆E-96 系列 E-96series：
0805、1206、2010、2512 采用四位数字表示，前三位表示电阻值有效数字，第四位表示乘以 10 的次方数. For the dimension type of 0805,1206,2010,2512 express the resistance value with four digits, the first three digits are significant figures and the fourth denotes the number of zeros

例 for example：

→ 100 KΩ

0603 用三位代码表示，前二位表示 E-96 系列阻值代码，后一位字母表示乘数代码（见表三和表四）
for the dimension type of 0603, express the resistance value with three code, the first two digit code denote the resistance of E-96 series, and the third code of letter denote the multiplier (see the table one and two)

例 for example：

→ 2MΩ

☆小数点以“R”表示 the decimal point should be expressed by “R”

例 for example：

→ 5.6Ω

☆跨接电阻以“0”表示 the jumper should be expressed by “0”

例 for example：

→ 0Ω

☆0402：不作标记 for the dimension type of 0402, there is no mark on the glass side.

例 for example：

☆非 IEC 标准系列的电阻值标记表示方法：一般以最接近 IEC E-24 系列标称阻值的标记表示方法。

For the resistance which don't belong to IEC serial, use the resistance of IEC serial which is most close to the required resistance of non-IEC serial for replacement.

☆客户对标记有特殊要求时，则按照协商的结果印刷标记

to get agreement by both party if there special requirement for the marking

表三 table three：

E-96 系列阻值代码 E-96 series resistance value code

代号 code	E-96 阻值 The resistance of E-96 series	代号 code	E-96 阻值 The resistance of E-96 series	代号 code	E-96 阻值 The resistance of E-96 series	代号 code	E-96 阻值 The resistance of E-96 series
01	100	25	178	49	316	73	562
02	102	26	182	50	324	74	576
03	105	27	187	51	332	75	590
04	107	28	191	52	340	76	604
05	110	29	196	53	348	77	619
06	113	30	200	54	357	78	634
07	115	31	205	55	365	79	649
08	118	32	210	56	374	80	665
09	121	33	215	57	383	81	681
10	124	34	221	58	392	82	698
11	127	35	226	59	402	83	715
12	130	36	232	60	412	84	732
13	133	37	237	61	422	85	750
14	137	38	243	62	432	86	768
15	140	39	249	63	442	87	787
16	143	40	255	64	453	88	806
17	147	41	261	65	464	89	825
18	150	42	267	66	475	90	845
19	154	43	274	67	487	91	866
20	158	44	280	68	499	92	887
21	162	45	287	69	511	93	909
22	165	46	294	70	523	94	931
23	169	47	301	71	536	95	953
24	174	48	309	72	549	96	976

表四 table four：

乘数代码 multiplied code

乘数次方 multiplier	$\times 10^{-1}$	$\times 10^{-2}$	$\times 10^{0}$	$\times 10^{1}$	$\times 10^{2}$	$\times 10^{3}$	$\times 10^{4}$	$\times 10^{5}$
代 码 code	X	Y	A	B	C	D	E	F

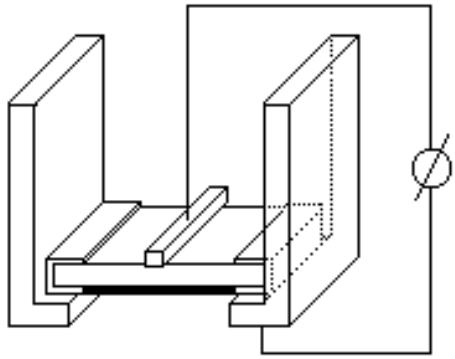
7.0 产品外观 Appearance

项 目 Item	标 准 Specification
产品外观 Appearance	1、电阻器表面二次玻璃体保护膜覆盖完好且难以脱落,表面平整,; the resistive element should be covered with protective coating that don't fade easily, the surface of coating should avoid unevenness, 2、电阻器端电极覆盖均匀、镀层较难脱落、而且平整、无开裂、针孔、变色; the electrode should be printed uniformly, the plating should not fade easily, and should avoid unevenness, flaw, pinhole and discoloration. 3、电阻器芯片无裂痕、标记可辨 the resistive element should is crack-free, and the marking is readable.

8.0 电气性能 Performance Specification

项 目 Item	标 准 Specification				试验方法 Test Methods (JIS C 5202)
	片 状 电 阻 器 Resistor		跨接电阻 Jumper		
电阻值 Resistance	电阻值应在规定的误差范围内 Resistance Value Shall be within the specified tolerance		≤50mΩ		T:25±2℃ RH≤65%.
电阻温度系数 Resistance Temperature Coefficient					测定范围 Measured Between -55℃～+125℃
	型号 type	电 阻 值 Resistance	电阻温度系数 Resistance Temperature Coefficient	代号 code	
	0603 0805 1206 2010 2512	1Ω≤R<10Ω 1MΩ<R≤10MΩ	±250PPM/℃	L	
		10Ω≤R≤1MΩ	±100PPM/℃	K	
		R<1Ω R>10MΩ	±500PPM/℃	M	
	0402	1Ω≤R<10Ω 1MΩ<R≤10MΩ	±400PPM/℃	U	
		10Ω≤R≤1MΩ	±200PPM/℃	W	
短时间过负载 Short Time Overload	外观无可见损伤. No obvious damage. △R≤±(2.0%R+0.1Ω)		外观无可见损伤. No obvious damage. ≤50mΩ		对电阻器施加2.5 倍额定电压,或最大过负载电压(取最小值),持续5秒, apply 2.5 times rated voltage or the max. overload voltage(choose the small one) for 5 seconds.

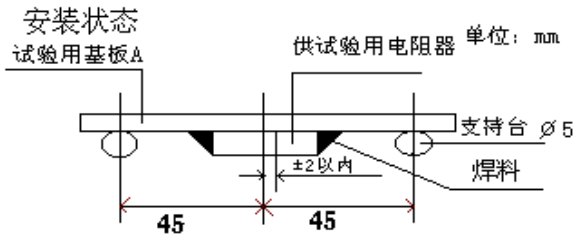
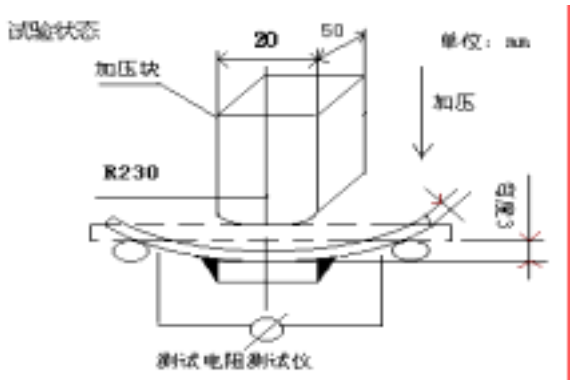
续上表 continue

项 目 item	标 准 specification		试 验 方 法 test method (JIS C 5202)
	片状电阻器 resistor	跨接电阻 jumper	
绝缘电阻 Insulation Resistance	1000MΩ Min		在电极与基片间施加 100V 直流电压,保持 1 分钟,然后测绝缘电阻值. Apply DC 100V between substrate and termination for 1 minute, then check insulation resistance . 

9.0 机械性能 machinery characteristic

项 目 item	标 准 specification		试 验 方 法 test method (JIS C 5202)
	片状电阻器 resistor	跨接电阻 jumper	
可焊性 solder-ability	可焊面积≥95%. The termination coverage should be 95% min		将片状电阻器浸入非活性焊剂中浸渍大约 2S,然后去除多余焊剂,将片状电阻器浸入到焊料槽内深达 10mm,焊料槽温度为 235±5°C,浸入时间为 2±0.5 秒,用溶剂清洗掉电阻器上的焊剂残余物,后在 10 倍放大镜下观察. Resistor should be dipped in the melted solder bath at 235±5°C for 2±0.5 sec. Flux should be removed from the surface of the termination with clean organic solvent.

续上表 continue

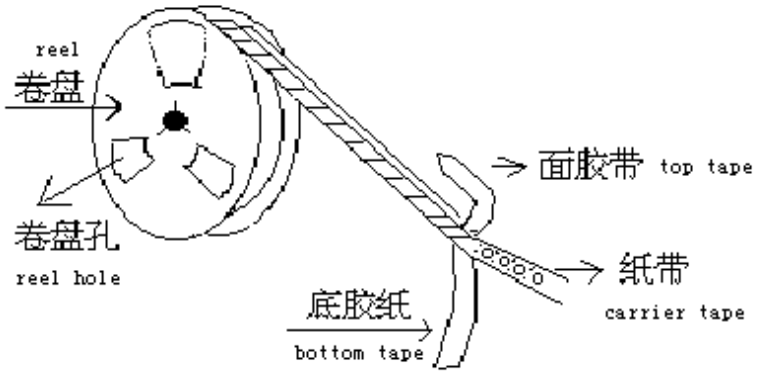
项 目 item	标 准 specification		试 验 方 法 test method (JIS C 5202)
	片状电阻器 resistor	跨接电阻 jumper	
耐焊接热 resis-tance to soldering heat	外观无可见损伤,标记可辨. No obvious damage with readable mark △R≤± (1.0%R+0.05Ω)	外观无可见损伤,标记可辨. No obvious damage with readable mark ≤50mΩ	将片状电阻器浸入焊料槽内深达 10mm,焊料槽内温度为 260±5°C,浸入时间10±1秒,在室温放置1～2小时. 用溶剂将多余的焊剂清洗掉，然后测量电阻值。Resistor should be dipped in the melted solder bath at 260±5°C for 10±1 sec, Flux should be removed from the surface of the termination with clean organic solvent., resistor should be exposed at room condition for one or two hours, then check the resistance value.
引出端镀层连接强度 bending strength	外观无机械损伤 no mechanical damage △R≤± (1.0%R+0.05Ω)	外观无机械损伤 no mechanical damage ≤50mΩ	基板:环氧玻璃层压印制线路板,厚度:1.6mm Substrate :Glass Epoxy (t=1.6mm) 铜箔厚度 Thickness of Copper foil:0.035mm 支持台距离 Span:90mm. 弯曲距离 Bending Distance: 0402、0603、0805、1206:3mm 2010、2512 : 2 mm 弯曲速度 bending speed :1mm/S  

10.0 耐气候性能 environment test

项 目 item	标 准 specification		试 验 方 法 test method (JIS C 5202)
	片状电阻器 resistor	跨接电阻 jumper	
温度快速变化 rapid temperature cycle	△R≤± (1.0%R+0.05Ω)	≤50mΩ	-55°C±3°C 30 分钟←常温≤5 分钟→125°C±3°C 30 分钟连续 5 个循环.电阻器在标准大气条件下恢复不少于 1 小时,也不多于 2 小时. -55 °C ± 3 °C for 30mins ← normal temp. for 5mins →125°C±3°C for 30mins , total 5 个 cycles.
稳态湿热 humidity (steady state)	△R≤±(3.0%R+0.1Ω)	≤50mΩ	电阻器在温度为 40±2°C,湿度 90～95%湿热试验箱内维持 1000+48/-0 小时. Resistor should be exposed at 40±2°C and 90~95% relative humidity in a humidity test chamber for 1000+48/-0 hours
负载寿命 (70°C耐久性) load life	△R≤±(3.0%R+0.1Ω)	≤50mΩ	在温度在 70±2°C环境状态下以 1.5 小时通,0.5 小时断周期地施加电压(额定电压或最大工作电压两者较小者),持续进行 1000+48/-0 小时. Resistor should be exposed at70±2°C for 1000+48/-0 hours ,during this time the rated voltage or the max working voltage (choose the small one)shall be applied intermittently for 1.5 hours ON,0.5 hours OFF
耐溶剂性 resistance to solvent	外观无可见损伤 no obvious damage △R≤±(1.0%R+0.05Ω)	外观无可见损伤 no obvious damage ≤50mΩ	溶解溶液:三氯乙烯,浸 10±1 小时. Dipping in solvent solution of Isopropyl alcohol for 10±1 hours.

11.0 编带包装说明 tape and reel package

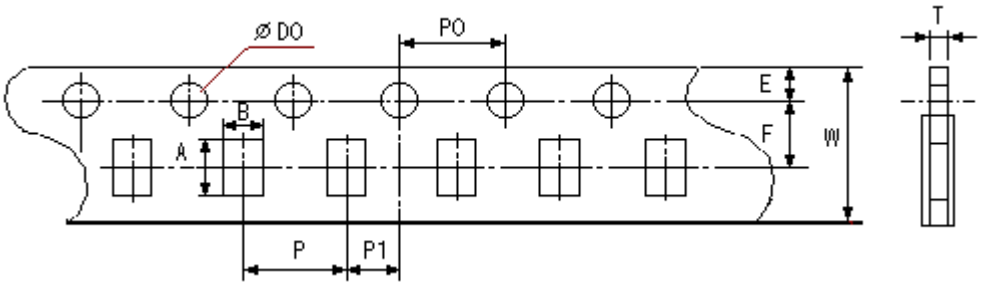
11.1 结构尺寸 dimension and structure



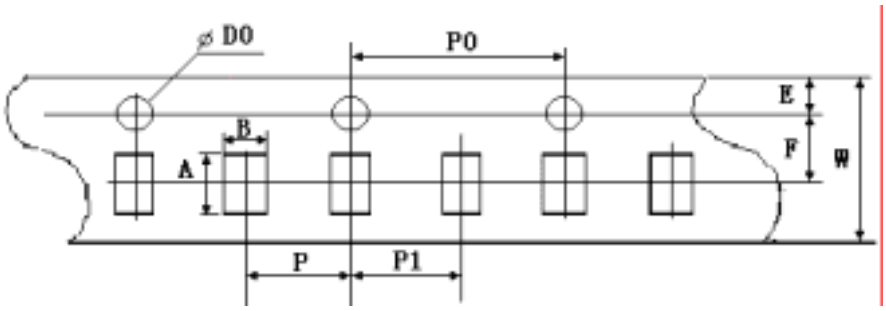
11.1.1 载带尺寸 carrier tape dimension

◆纸带编带 paper carrier tape

for 0603、0805、1206 type



For 0402 type

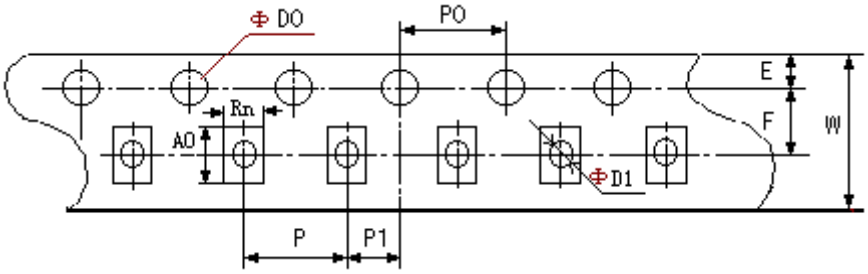


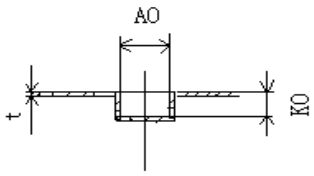
单位 unit:(mm)

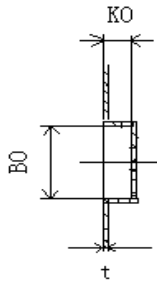
型号 type	A	B	W	F	E
0402	1.2±0.1	0.7±0.1	8.0±0.20	3.5±0.05	1.75±0.1
0603	1.85±0.1	1.10±0.1	8.0±0.20	3.5±0.05	1.75±0.1
0805	2.35±0.1	1.65±0.1	8.0±0.20	3.5±0.05	1.75±0.1
1206	3.50±0.2	1.90±0.2	8.0±0.20	3.5±0.05	1.75±0.1

型号 type	P	P0	P1	ΦD0	T
0402	2.0±0.05	4.0±0.1	2.0±0.05	1.5±0.1	0.6Max
0603	4.0±0.1	4.0±0.1	2.0±0.05	1.5±0.1	0.60±0.1
0805	4.0±0.1	4.0±0.1	2.0±0.05	1.5±0.1	0.75±0.1
1206	4.0±0.1	4.0±0.1	2.0±0.05	1.5±0.1	0.75±0.1

◆塑料带编带 plastic carrier tape







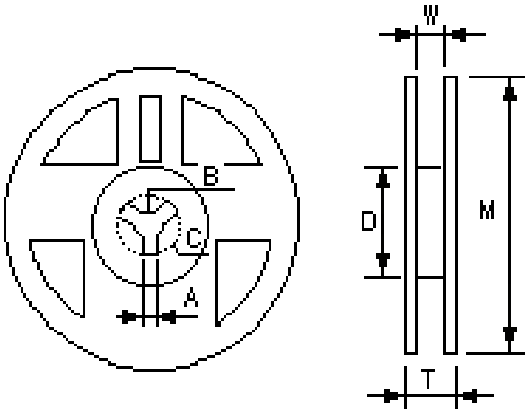
单位 unit：mm

型号 type	A0	B0	W	F	E	t
2010	5.45±0.10	2.77±0.10	12.00±0.10	5.50±0.10	1.75±0.10	0.24±0.05
2512	6.73±0.10	3.40±0.10	12.00±0.10	5.50±0.10	1.75±1.10	0.24±0.05

型号 type	P	P0	P1	ΦD0	ΦD1	K0
2010	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	0.84±0.10
2512	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	0.81±0.10

11.1.2 卷盘尺寸 reel dimension 单位 unit:(mm)

型号 type	M	W	T	A	B	C	D
0402 0603 0805 1206	178±2.0	10.0±1.5	12.0±2.0	2.5±0.5	13.0±0.5	31.0±1.0	80.0±1.0
2010 2512	178±2.0	13.0±1.5	15.5±2.0	2.5±0.5	13.0±0.5	31.0±1.0	57.0±2.0



11.2 编带包装标准 taping specification

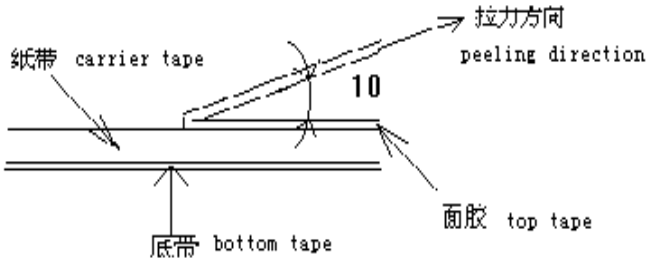
11.2.1 能力 ability

★面带拉力 top tape peel strength

面带拉力强度为 5～50g(0.049N～0.49N),经下列试验后不允许有破裂断带现象。

Peel strength is 5～50g (0.049N～0.49N), and should not have flash and tear after peeling .

测试方法 test method：



★ 最小弯回半径 minimum bending radius：

当载带弯回到胶盘最小盘心半径时（50mm），应无漏片和载带破损现象。When carrier tape being bent by minimum bending radius(50mm),no defection of chip and no break of carrier tape,

★ 面胶温度测试 resistance to climate (for top tape)

在温度为 60℃，湿度 90～95%条件下，维持 120 小时后，面带不会自动剥离。

The top tape don't peel off after exposing at 60℃，90～95% RH. for 120 hours

芯片松动自如,无粘面、底胶现象.

Resistor is free, no sticking to top tape and bottom tape.

芯片易从纸带中取出,且芯片孔无机械损伤.

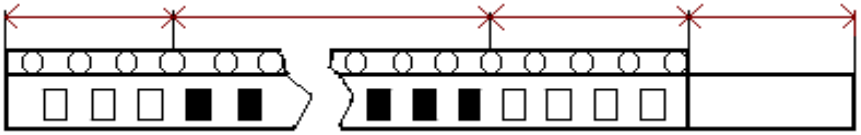
Resistor is easy to take out from carrier tape and chip hole have no mechanical damage.

11.2.2 编带包装数量 quantity in taping

型号规格 type	数量 quantity（PCS / reel）
0402	10000
0603 0805 1206	5000
2010 2512	4000

无元件 no components　有元件 have components　无元件 no components　牵引带（仅面胶）lead Tape（only top tape）

终端部　前端部　牵引带



纸带输送方向 Direction of Feeding

长度 length

终端部 terminal	前端部 front	牵引带 lead tape
110～140mm	200-250mm	300-350mm

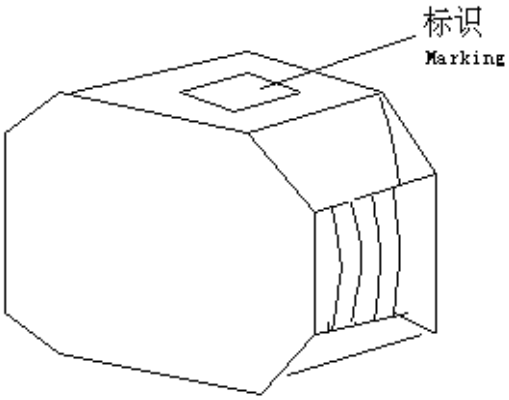
11.3 外包装 outer packaging

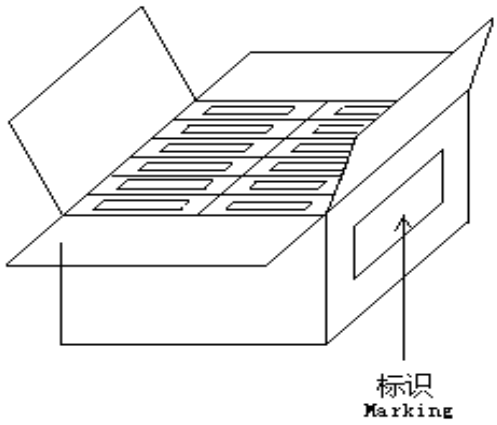
第一次包装：数量：1 卷～10 卷

the first package ：1~10 reels

第二次包装： 数量：最少 6 盒

the second package：6case Min。





▲当包装数量不能达到最大时,剩余空隙部位采用辅助材料填满.
When quantity shall not reach the max , the remaining empty space shall be buried with buffer material
▲ 当数量为最小时,使用别的方法包装,确保运输过程中无问题是至关重要的.
When the quantity is a few, alternative packing methods may be used。It is very important to ensure the safety of the products during transportation。

11.4 标签 label

● 卷盘标签 label on the reel

(1.客户物料号 customer part No. 2.客户订单号 customer P/O) 3.风华型号规格 fenghua Part No
4.数量 quantity 5.公称阻值 resistance 6.额定功率 rated power
7. 电阻值误差 tolerance 8.出厂日期 delivery date 9.QC 印章 QC marking

● 内箱标签 label on inner packaging box

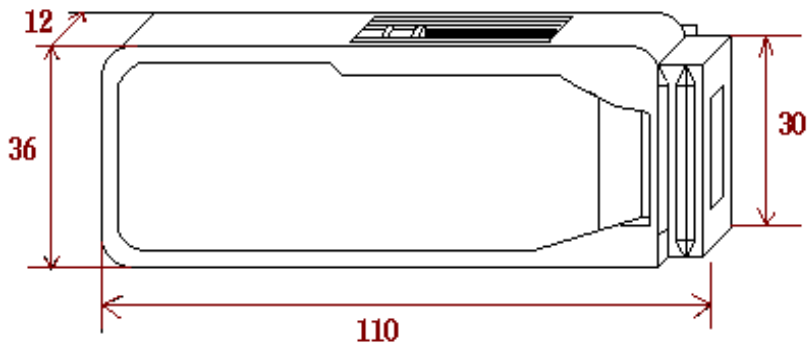
(客户物料 customer part No. 2.客户订单号 customer P/O) 3.风华型号规格 fenghua Part No
4.数量 quantity 5.公称阻值 resistance 6.额定功率 rated power
7. 电阻值误差 tolerance 8.出厂日期 delivery date 9.QC 印章 QC marking

● 外箱标签 label on outer packaging box

1.客户名称 customer name 2. 合同编号 contract No. 3. 产品名称 product name
4.风华型号规格 fenghua part NO. 5.数量 quantity 6.箱号 case No.
7. 制造者名称 maker name 8.QC 印章 QC marking

注: ( )部分可按客户要求而定.
Re mark :( ) part according to customer's requirement

12.0 塑料盒包装说明 Bulk Case packaging
12.1 结构尺寸 dimension and structure



12.2 包装数量 quantity in bulk case

型　号 type	数量 quantity
0603	25,000 PCS
0805	10,000 PCS
1206	5,000 PCS

13.0 贮存方法 Storage Methods:

●贮存条件:温度 5～35℃,相对湿度≤65%.

Storage Conditions: T：5～35℃,RH≤65%RH.