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规 格 书
Specification For Approval

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产品名称 Product Name	热保护型压敏电阻 Thermal Fuse & MOV (TFMOV)
产品描述 Product Description	TFMOV25S271-IT_5 Pin
产品型号 Product Model	TFMOV25S271-IT
产品编码 Product Code	1001000148004
最大连续工作电压，标称放电电流 Maximum Continuous Operating Voltage & Nominal Discharge Current	U_c: 175 Vac, I_n: 10 kA (8/20 μs)
安规认证 Agency Approvals	UL ,cUL ,TUV
制造商 Manufacturer	厦门赛尔特电子有限公司 Xiamen SET Electronics Co.,Ltd.
产地 Country of Origin	中国 China

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客户批准 Customer Approval

客户名称 Customer Name	SEA Electronics Ukraine LLC.	
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结论 Conclusion	☐合格（承认） Qualified	☐不合格 Unqualified
	不合格原因 Root Cause:	
生效日期 Effective Date	年 YY 月 MM 日 DD	

经办 Prepared By	审核 Reviewed By	核准 Approved By

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1 适用 Scope

本承认书适用于型号为 TFMOV25S271-IT 的热保护型压敏电阻。
The specification is applicable for TFMOV, and the product model is TFMOV25S271-IT.

2 术语 Glossary

2.1 最大连续工作电压 Maximum Continuous Operating Voltage

25°C 时，可以连续施加在 SPD 上的最大交流电压（有效值）或最大的直流电压值，交流电压波形应为基本的正弦波形（总谐波畸变＜5%）。
Maximum sinusoidal AC voltage (r.m.s)(less than 5% total harmonic distortion) or maximum DC voltage which may be applied continuously to the SPD at a temperature of 25 °C.

2.2 限制电压 Clamping Voltage (V_c)

压敏电阻流过规定波形的峰值电流（I_p）时，MOV 两端的最大电压。
Maximum peak voltage developed across the varistor when passing an 8/20 μs class current pulse (I_p).

2.3 标称压敏电压 Nominal Varistor Voltage (V_N)

1 mA 的直流电流通过压敏电阻时，压敏电阻两端的电压。
Voltage across the varistor measured at 1 mA of DC current.

2.4 静态电容 Typical Capacitance

测试频率 1 kHz，正弦波电压小于 1 V 时的测试值，要在制造商规定的范围之内。
Capacitance between two terminals of the varistor measured at 1 kHz, a sinusoidal voltage＜1 V r.m.s.

2.5 实测限制电压 Measured Limiting Voltage (MLV)

流过规定波形和幅值的浪涌时，在端子、引脚、接触点和类似位置上测得的最大电压值。
Highest value of voltage that is measured across the terminals of the SPD during the application of impulses of specified waveform and amplitude.

2.6 限压比 Voltage Clamping Ratio

限制电压（@I_n）与压敏电压的比值。
The value of clamping voltage(@I_n) divided by varistor voltage.

2.7 标称放电电流 Nominal Discharge Current (I_n)

流过 SPD，具有为 8/20 μs 波形电流的峰值，用于产品的动作负载测试。
Crest value of the current through the SPD having a current waveform of 8/20 μs, for operating duty test.

2.8 最大放电电流 Maximum Discharge Current (I_{max})

流过 SPD，具有为 8/20 μs 波形电流的峰值，其峰值大小由厂家规定。I_{max} 应大于 I_n。
Crest value of a current through the SPD having an 8/20 μs waveform and magnitude is specified by manufacturer. I_{max} is equal to or greater than I_n.

2.9 最大脉冲能量 Single Pulse Transient Energy (W_{max})

施加 2 ms 方波或 10/1000 μs 电流脉冲时，压敏电阻所能吸收的单次最大能量。

Energy which may be dissipated for a single 2 ms square wave or 10/1000 μs pulse of a maximum rated current, with rated AC/DC voltage applied, without causing device failure.

2.10 额定电压 Rated Voltage (U_r)

允许用于电路并安全断开的最高电压。

The maximum voltage that is allowed to apply to the circuit in which the thermal-link is able to open safely.

2.11 额定电流 Rated Current (I_r)

允许用于电路并安全断开的最大电流。

The maximum current that is allowed to apply to the circuit in which the thermal-link is able to open safely.

2.12 受限电流等级 Level of Limited Current

参照 UL 1449 第四版 44.4 条款“非正常电压受限电流测试”的试验方法，产品能够承受的限制电流值。

The maximum limited current at which the product can pass the test, according to the UL 1449 4th clause 44.4.

2.13 暂时过电压值 Temporary Overvoltage Test Value (U_T)

施加在 SPD 上并持续一个规定时间 t_T 的试验电压，以模拟在 TOV 条件下的应力。

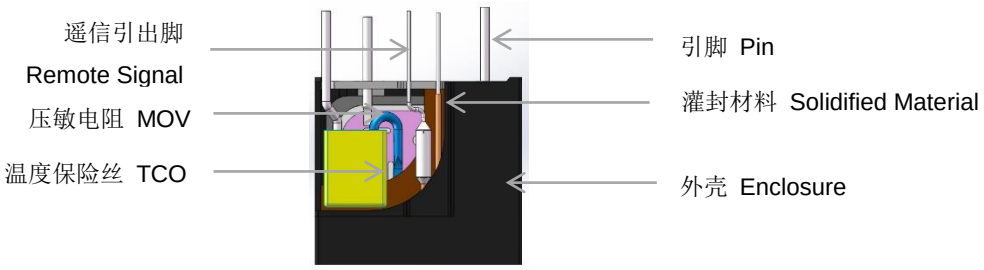
Test voltage applied to the SPD for a specific duration t_T, to simulate the stress under TOV conditions

3 结构尺寸 Structure and Dimension

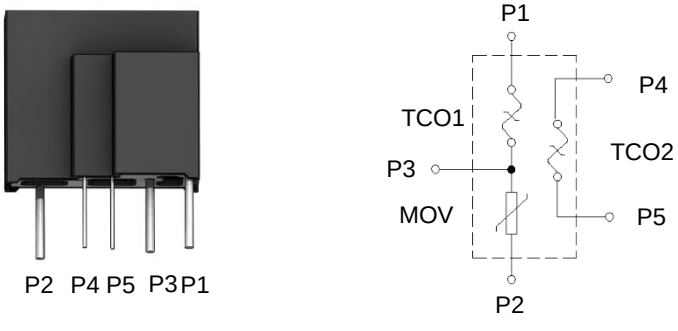
3.1 结构图 Structure

产品结构：内置合金型温度保险丝与压敏电阻表面紧邻，具有遥信功能，高阻燃黑色外壳封装，常闭的遥信由温度保险丝引脚 P4、P5 引出。

Product Structure: Square, built in alloy Thermal-link (TCO) closed to varistor’s (MOV’s) surface, with the remote signaling function and packed by high flame resistant black enclosure, the normally closed signal indication is brought out by the Thermal-link (TCO) leads P4 and P5.



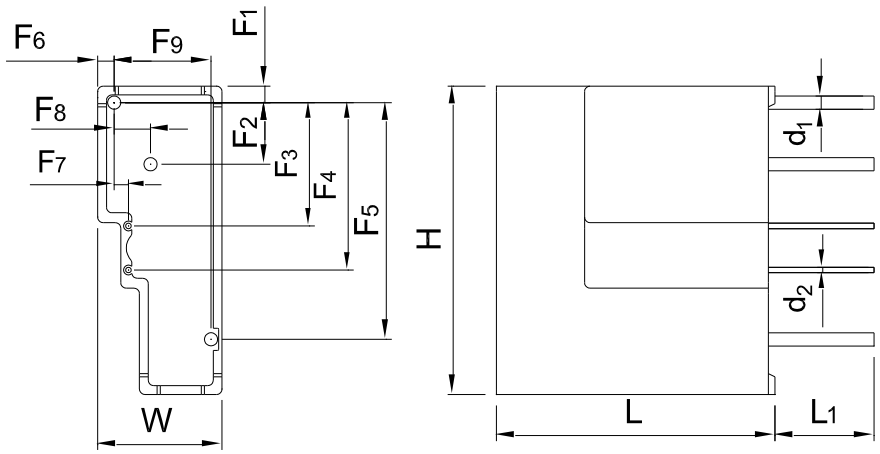
3.2 电路图 Circuit Diagram



3.3 主要原材料明细 Main Material List

项目 Items	编号 NO.				
	1	2	3	4	5
零件名 Part Name	压敏电阻 Metal Oxide Varistor	温度保险丝 Thermal-link	外壳 Enclosure	引脚 Pin	灌封材料 Solidified Material
材质 Materials	氧化锌 Zinc Oxide	易熔合金 Fusible Alloy	聚苯硫醚 PPS	镀锡铜线 Tin Copper	环氧树脂 Epoxy Resin

3.4 尺寸 Dimension (mm)



L	H	L_1	d_1	d_2	W
25.3±1.0	28.0±1.0	9.0±1.0	Φ1.2±0.05	Φ0.5±0.05	9.8±1.0
F_1	F_2	F_3	F_4	F_5	F_6
1.5±0.5	5.6±0.5	11.2±0.5	15.2±0.5	21.5±0.5	1.5±0.5
F_7	F_8	F_9			
1.3±0.5	3.3±0.5	7.3±0.5			

4 安规认证 Agency Approvals

认证机构 Agency		标准 Standards	认证号 File NO.	类别 Category
	UL	UL 1449 4th	E322662	VZCA2
	cUL	CSA C22.2 NO.8 13 CSA ECN 516	E322662	VZCA8
	TUV	EN 61643-11	J 50210179	T2

5 技术参数 Specifications

技术术语 Glossary of Terms		技术参数 Specifications	参照标准 Reference Standards
工作温度 Operational Temp. Range		-40 °C - 85 °C	IEC 61051
存储温度 Storage Temp. Range		-40 °C - 85 °C	IEC 61051
标称压敏电压 Nominal Varistor Voltage (V_N)		270 V (243 V～297V)	IEC 61051
漏电流 Leakage Current (75% of V_N)		≤20 μA	IEC 61051
最大连续工作电压 Max. Continuous Operating Voltage		AC: 175 V/DC: 225 V	IEC 61051
最大限制电压 Max. Clamping Voltage		455 V (@I_p 175 A)	IEC 61051
标称放电电流(15 次) Nominal Discharge Current (I_n) (15 times)		10 kA (8/20 μs)	IEC 61643.11
最大放电电流(1 次) Max. Discharge Current (I_{max}) (1 time)		25 kA (8/20 μs)	IEC 61643.11
最大能量 Maximum Energy		340 J	IEC 61051
电容量 Typical Capacitance		2450 pF	IEC 61051
绝缘电压（引脚与外壳间） Dielectric Voltage (Between Leads and Enclosure)		≥2500 V,1 minute	IEC 61051
引线拉力试验 Lead Pull Test		22.62 N	IEC 60068-2-21
引线弯折试验 Lead Bending Test		180°,4 次 times	IEC 60068-2-21
暂时过电压 Temporary Overvoltage（TOV）——特性 Characteristic	设备内低压系统故障引起 LV-system faults in consumer installation	207 V_{rms} / 5 sec. —耐受模式 Withstand Mode	IEC 61643.11
	配电系统的低压系统故障和缺零 LV- system faults in distribution system and loss neutral	270 V_{rms} / 10 A / 120 min. —可接受的安全失效模式 Safe Failure Mode Acceptable	IEC 61643.11
供电侧过电流保护装置最大值 Max. Mains-side Overcurrent Protection		C 16 A	IEC 61643.11
最大供电侧过电流保护装置下额定短路电流 Short-circuit Current Rating for Max. Mains-side Overcurrent Protection (I_{SCCR})		1.5 kA_{rms}	IEC 61643.11

TCO 参数 Specifications						
项目 Items	额定动作温度 Rated Functioning Temp. （T_f）	熔断温度 Fusing Temp.	额定电压 Rated Voltage (U_r）	额定电流 Rated Current （I_r）	保持温度 Holding Temp. （T_h）	最高极限温度 Maximum Temp. Limit （T_m）
主回路 TCO TCO of Main Circuit	125 °C	（121±2）°C	690 Vac	15 /16 A	95 °C	200 °C
遥信 TCO TCO of Remote Signling	125 °C	（121±2）°C	250 Vac 50 Vdc	1 A	100 °C	200 °C

6 检验 Inspection

6.1 大气条件 Atmospheric Conditions

温度 Temperature：15 °C - 35 °C
相对湿度 Relative Humidity：45% - 75%
大气压力 Air pressure: 86 kPa to 106 kPa

6.2 常规检验项目 Routine Inspection Items

序号 No.	项目 Items	试验要求 Test Requirement	参考标准 Reference Standards	抽样频率和接受标准 AQL
1	外观 Appearance	壳体无穿孔，飞边；引脚镀层良好，无氧化发黑等情况，具体参照 SET 文件 QA-08-2002-001《TFMOV 系列成品检验规范》。 The case without perforation, flash, the pin coating is good and no oxidative blackening, with specific reference to the SET file 《TFMOV Series Specification for Inspection of Finished Products》QA-08-2002-001.	企业标准 SET Standard	G-Ⅱ, AQL=1.0
2	尺寸 Dimension	用游标卡尺测量引脚外露长度，尺寸范围参照 3.4。 Use vernier caliper to measure the pin out length, size range reference 3.4.	企业标准 SET Standard	S-2, AQL=0.65
3	标称压敏电压 Nominal Varistor Voltage (V_N)	1 mA 的直流电流通过压敏电阻时测压敏电阻两端的电压，需满足在电压范围内。 The voltage shall be to meet the specified value when it across the varistor measured at 1 mA of DC current.	IEC 61051	G-Ⅱ, AQL=0.25
4	漏电流 Leakage Current	在 25 °C 温度下，施加 0.75 倍压敏电压时，测通过压敏电阻的电流≤20 μA。 Measure the current passing through the varistor at 0.75 V_N, and at a temperature of 25°C, the leakage current shall be no more than 20 μA .	IEC 61051	G-Ⅱ, AQL=0.25
5	绝缘电压 Dielectric Voltage	在引脚和外壳间施加工频电压≥2500 V，1 分钟。 Subject the voltage no less than 2500 V, last for 1 minute between leads and enclosure.	IEC 61051	S-2, AQL=1.0
6	动作负载试验 Operating Duty Test	参见第 6 章节《检验》第 6.4 条 Reference 6.4 of the chapter 6《Inspection》	IEC 61643-11 / GB/T 18802.1	3 PCS/Lot AC=0
7	电压保护水平测试 Voltage Protection Level Test	参见第 6 章节《检验》第 6.5 条 Reference 6.5 of the chapter 6《Inspection》	IEC 61643-11 / GB/T 18802.1	3 PCS /Lot AC=0
8	非正常电压受限电流测试 Limited Current Abnormal Overvoltage Test	参见第 6 章节《检验》第 6.6 条 Reference 6.6 of the chapter 6《Inspection》	UL 1449 第 4 版 (4th Edition)	3 PCS /Lot AC=0

6.3 机械特性 Mechanical Performances

序号 NO.	项目 Items	试验方法 Test methods/conditions	参考标准 Reference Standards	抽样频率和允收标准 AQL
1	拉力 Pull	将待测试产品安装于测试架上，将 P1、P2、P3 引脚分别与 22.62 N 的砝码挂钩绑牢，受力时间 1 分钟，轻放砝码。 Install the product on the test shelf and tie P1 /P2/P3 respectively with 22.62 N weight for 1 minute. Then release the weights slightly.	企业标准 SET Standard	3 PCS/Lot, AC=0 封口树脂与引脚不损伤、脱落。 The sealed resin shouldn't fall off and the lead wires shouldn't be damaged.
2	推力 Push	将待测试产品壳体套入推力试验仪上孔内，将推力夹具套入引脚，距离外壳口部 2 mm 处旋紧，施加 5.66 N 的压力，受力时间 1 分钟。 Fixed the product case in the hole of the thrust test instrument. Cover the lead wire with the thrust fixture and firmly seated at 2 mm from the case. The product should be under 5.66 N pressure for 1 minute.	企业标准 SET Standard	3 PCS /Lot, AC=0 封口树脂与引脚不损伤、脱落。 The sealed resin shouldn't fall off and the lead wires shouldn't be damaged.

6.4 动作负载试验 Operating Duty Test

测试方法：冲击 2 次 I_n（正、负极各 1 次）测试限制电压，再施加 15 次 I_n 冲击，每 5 次为 1 组，每次间隔 1 分钟，每组间隔 30 分钟；30 分钟后再进行 2 次 I_n（正、负极各 1 次）测试限制电压

Test Method: The sample shall be subjected to 2 time pulse I_n (one time of positive and one of negative polarity) to determine Clamping Voltage. Surges shall be applied in 3 groups of 5 surges. After each surge, the sample shall rest for 1 minute. After each group of 5 surges, the sample shall rest for 30 minutes. 30 minutes later, determine the Clamping Voltage with 2 time pulse I_n (one time of positive and one of negative polarity).

判定标准：产品在测试中不能有可见可闻的损坏，测试前后限制电压的变化率<10%。

Pass Criteria: During and following the surge test, there shall not have visible or smelt (or both) damage, and the rate of the clamping voltage's variation shall be less than 10%.

6.5 电压保护水平测试 Voltage Protection Level Test

测试方法：试品 P1-P2 冲击 2 次 I_n（正、负极各 1 次）测试限制电压，再施加 2 次 I_{max} 冲击（正、负极各 1 次）测试限制电压，每次冲击的间隔时间应足以使试品冷却到环境温度。

Test Method: The sample shall be subjected to 2 times pulse I_n (one time of positive and one of negative polarity) to determine Clamping Voltage, then applied 2 times pulse I_{max} (one time of positive and one of negative polarity) to determine Clamping Voltage, after each pulse, the rest time should be let samples cooled to the ambient Temperature.

判定标准：电压和电流波形图及目测检测试品应没有击穿或闪络的现象；试验过程中不应发生可见损害；不应对人员或设备产生爆炸或其他危险；试验后试品电压值小于或等于 U_p.

Pass Criteria: Voltage and current records and visual inspection shall show no indication of puncture or flashover. No visible- damage shall occur during the test; Values for measured limiting voltage after the test shall be below or equal U_p.

6.6 非正常电压受限电流测试 Limited Current Abnormal Overvoltage Test

测试方法：依 UL 1449 第 4 版中的图 44.4 所示，调节测试电压为 240 V，将测试样品端短路，调节可变电阻，使测试电流分别为 5 A 和 10 A。接入样品进行测试，测试时间为 7 小时，直至温度或电流达到平衡，或测试未满 7 小时产品内部温度保丝断开。

Test Method: See the figure 44.4 in UL 1449 4th Edition. Adjust test voltage to 240 V. The power supply is to incorporate a series variable resistor that can be adjusted to obtain the short-circuit current 5 A and 10 A. The samples are to be energized for 7 hours, until current or temperatures attain equilibrium, or until the samples become disconnected from the ac supply and the test time less than 7 hours.

判定标准：测试过程中产品不允许发出火焰,纱布起火和引燃外壳，产品中温度保险丝断开后 5 分钟内测试引脚 P1、P2 之间在规定电压下的漏电流要求小于 0.5 mA。

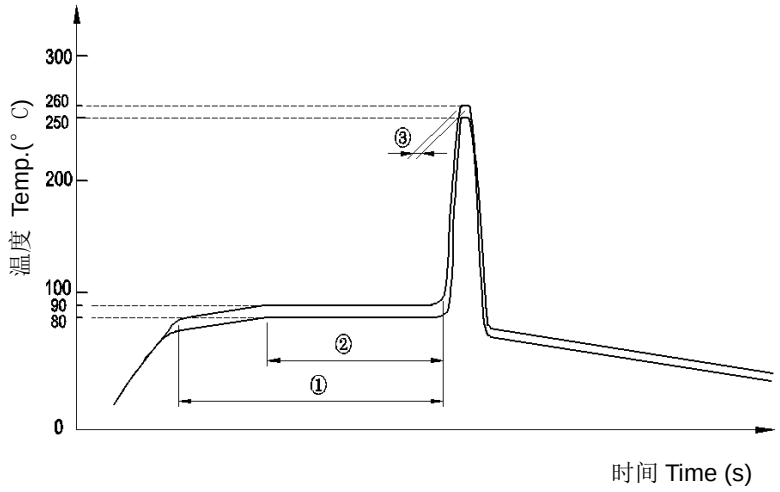
Pass Criteria: During the test, there shall be no emission of flame, flaming of the gauze or Ignition of the enclosure, within five minutes the in-built thermal-link is connected from the ac supply, P1 and P2 is applied with a specified voltage, and the leakage current must be less than 0.5 mA.

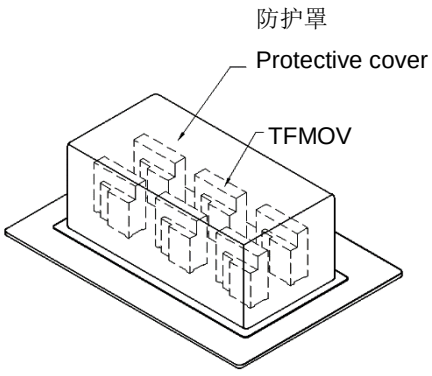
7 推荐焊接条件 Soldering Conditions

7.1

本产品可满足波峰焊，注意产品引脚超出 PCB 焊盘长度不要大于 3 mm，预热温度控制于 90 °C 以内，波峰温度小于 260 °C，过锡时间≤4 s。进行焊接时建议：增加防护罩减少产品吸热、产品过波峰后加降温设施使温度快速降至室温。推荐按下面焊接曲线图设置：

The product is available for wave soldering, the length of exposed pins should be less than 3 mm and do keep the preheat temperature below 90 °C, soldering temperature should be less than 260 °C, tinning time should be less than 4 s. During wave soldering, a protective cover can be applied to protect the product from the heat, or after wave soldering cooling equipment is recommended to rapidly reduce the product to room temperature. Recommend as following graph.





① 预热时间 Preheat time：(①＜150 s ② ＜100 s) ③过锡时间 Dip time≤4 s

以上曲线仅供参考 This curve is our recommendation and reference only

7.2 如采用烙铁焊接，请注意烙铁温度与焊接时间，推荐焊接条件为：
If you use iron to weld, please pay attention to the iron temperature and soldering time：

项目 Item	条件 Condition
烙铁头温度 Iron Temperature	350 °C (Max.)
焊接时间 Soldering Time	4 s (Max.)
焊锡点位置离产品底部 Space Between Soldering Point and the Bottom of Product	2 mm (Min.)

8 注意事项 Important Note

8.1 该产品为内置低熔点合金型温度保险丝的压敏电阻，当使用波峰焊或手工焊接工艺时，生产前应该做充分前期工艺验证，预防内部温度保险丝受热冲击损伤。
The TFMOV contains a low melting point alloy type thermal-link inside. When waving soldering or hand soldering applied, the prophase process verification should be carried to avoid the thermal-link damaged by thermal shock.

8.2 如果用于直流电路，系统电压为 300 V～500 V，需在温度保险丝(TCO)两端并联 1 个 500 Vdc 1 A 电流保险丝；系统电压为 500 V～1000 V，需在温度保险丝两端并联 1 个 1000 Vdc 1 A 电流保险丝，达到直流分断效果。
When used for DC circuit, if the system voltage is 300 V～500 V, TCO shall be paralleled a fuse of 500 Vdc 1 A; If the system voltage is 500 V～1000 V, TCO shall be paralleled a fuse of 1000 Vdc 1 A, to achieve the effect of DC breaking.

8.3 装配时不要用丙酮等溶剂清洗本产品，以免破坏本产品的封装层。
When assembly, please don't use acetone and other solvents to clean products, so as not to destroy enclosure.

8.4 装配时应避免出现如敲击等作业方式，避免造成本产品出现机械损伤。
When assembly, please avoid knocking and such practices, so as not to make mechanical damage on products.

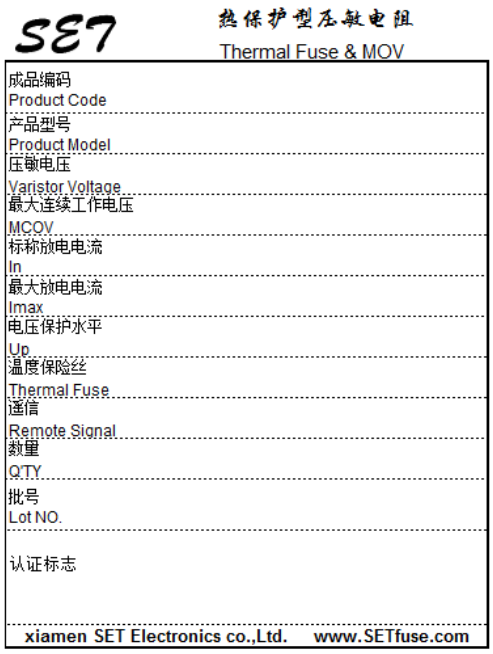
8.5 产品应用系统中出现的暂时过电压应小于 U_T，否则需进行其他设计，避免暂时过电压下的失效。
The Temporary Overvoltage Value in Product application system should be less than U_T, if not, some other designs are needed, to avoid failure which caused by the Temporary Overvoltage.

9 标示及包装 Marks and Package

9.1 本体标识 Product Marking:

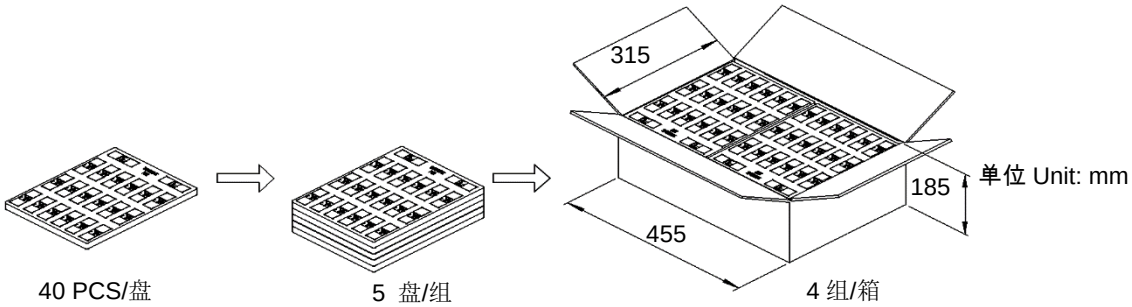
9.2 包装标签 Package Marking:

a) 成品编码 Product Code
b) 产品型号 Product Mode
c) 压敏电压 Varistor Voltage
d) 最大连续工作电压 Maximum Continuous Operating Voltage
e) 标称放电电流 Nominal Discharge Current
f) 最大放电电流 Maximum Discharge Current
g) 电压保护水平 Up
h) 温度保险丝 Thermal Fuse
i) 遥信 Remote Signal
j) 数量 Quantity
k) 批号 Lot NO.
l) 认证标志 Approval Marks



9.3 包装 Packaging

包装尺寸 **Dimensions (mm)**	吸塑盘 Blister Tray	外箱 Carton
	295 X 220	455 X 315 X 185



40 PCS/盘
40 PCS/Plate

5 盘/组
5 Plates/Mold

4 组/箱
4 Molds/Carton

10 产品批号&追溯号识别 Lot No. & Tracking No. System

10.1 产品批号识别 Lot No. System

10.1.1 以下图 X 所示的产品批号规则有效期至 2016 年 7 月 10 日。
This Lot No. rule Valid until July 10, 2016 in Fig. X.

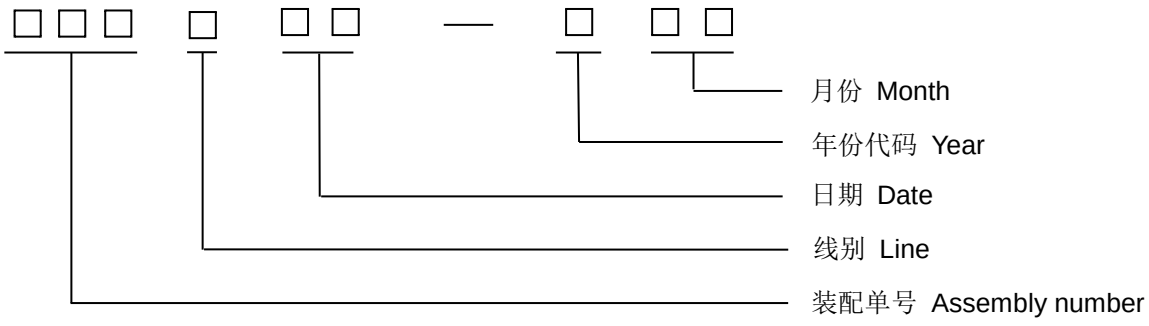


图 Fig. X 产品批号识别 Lot No. System

10.1.2 以下图 W 所示产品批号的规则自 2016 年 7 月 11 日号开始执行。
This Lot No. rule will apply from July 11, 2016 in Fig.W.

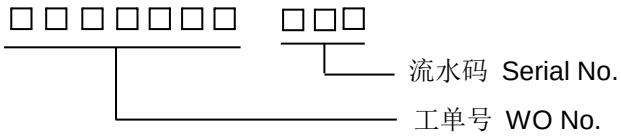


图 Fig. W 产品批号识别 Lot No. System

10.2 产品追溯号识别 Tracking No. System
以下所示产品追溯号规则自 2016 年 7 月 11 日号开始执行。
This Tracking No. rule will apply from July 11, 2016.

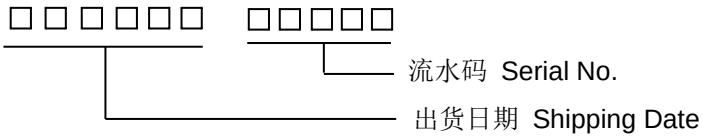


图 Fig. Y 外包装追溯号 Tracking No. on the Outer Package

11 储存条件和有效日期 Store Conditions and Effective Date

11.1 推荐长期存储条件 Recommend Long-term Storage Condition
存储温度 Storage Temperature：-10 °C - 40 °C；相对湿度 Relative Humidity: ≤75% RH。

11.2 不要将本产品存放在有腐蚀性气体或阳光直接照射的环境中保管。
Please don't store products in the environments of corrosive gas and direct sunlight.

11.3 存储期限：1 年。
Storage Period：1 Year.

12 规格书之有效性 Validity

12.1 有关修订之协议 Agreement of Revision
本承认书的内容若有不充分或有必要修订时，得由两公司协议后再行修订。
If the content of this specifications is inadequate or need revising, it will be revised after both parties' agreement.

12.2 有效性 Validity
本承认书提出后，于贵公司承认期间，可暂时使用，若经过 1 个月后贵公司无异议或无签回承认时，则视同有效文件运用,如有变更另行通知。
The specifications can be used temporarily during the period of approval. If you have no any objection or not return one hardcopy to us within one month, this specifications will be operated as a valid document. If any change, we will inform you.

-以下无正文 END

履历 Revision History

修订版本 Revision Version	描述 Description	页码 Page	日期 Date
1.0	新发行 New Issue	1-14	October 17, 2016
1.1	认证产品外壳增加认证标识 The enclosure of certified products increasing certification marks.	11	March 12, 2018