

■车规低温漂合金片式固定电阻器

Low-Temperature Drift Metal Strip Chip Fixed Resistor Automotive Grade

◆特征 Features

- * 最高功率可达 3W The highest power is up to 3W.
- * 最低 TCR 为±50 ppm/°C The lowest TCR is ±50 ppm/°C.
- * 低寄生电感小于 5 纳亨 Low inductance <5nH.
- * 适应再流焊与波峰焊 Suit for re-flow and wave flow solder.
- * 装配成本低，并与自动装贴设备匹配 Low assembly cost, suit for automatic SMT equipment.
- * 适于作电流探测用电阻器，如电源电路等 Current detecting resistors for power supply, etc.
- * 机械强度高、高频特性优越 Superior mechanical and frequency characteristics.
- * 符合 ROHS 指令要求和无卤素要求 Compliant with RoHS directive and halogen free requirement
- * 符合 AEC-Q200 汽车标准条款 Compliant with AEC-Q200 standard
- * 潮敏等级：MSL 1 MSL Class: MSL 1



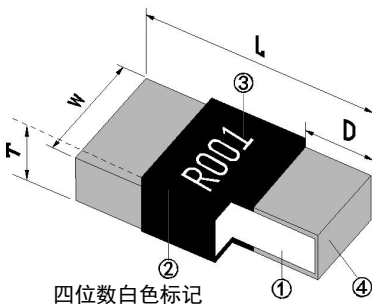
◆应用领域 Application

锂电模块、电源转换器、便携式设备、平板电脑、汽车电子（车载导航系统、车身电子控制系统）等。
Lithium battery module、Power Converter、Portable equipment、Table PC、Automotive Electronics (Vehicle navigation system、Electronic body control system) etc.

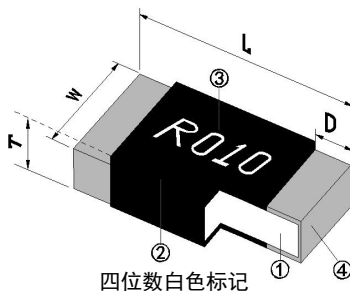
◆型号表示方法 Part Number

AMG	N	12	X	R001	F	T	D						
产品代号 Product Code	额定功率代号 Power Rating Code		型号代号 Type Code		电阻温度系数代号 T.C.R Code		电阻值代号 Resistance Value Code	阻值误差精度代号 Resistance Tolerance Code		包装方式代号 Packing Style Code		类别代号 Type Code	
车规低温漂合金片式固定电阻器 Low-temperature drift Metal Strip Chip Fixed Resistor Automotive Grade	代号 Code	额定功率 Power Rating	代号 Code	型号 Type	代号 Code	T.C.R ppm/℃	单位Ω，小数点用 R 表示 Units:Ω Decimal point should be Expressed "R" 例如 Example: R001=0.001Ω R010=0.010Ω	代号 Code	误差精度 Tolerance	代号 Code	包装方法 Packing Style	代号 Code	说明 Description
	L	2W	12	2512	H	±50		D	±0.5%	T	编带包装 Tape & Reel	D	低温漂 Low-temperature drift
	N	3W			X	±75		F	±1%				
								G	±2%				
								J	±5%				

◆产品结构 Construction



四位数字白色标记
Four digit white marking
(2512 ≤ R003 大电极 large electrode)



四位数字白色标记
Four digit white marking
(2512 ≥ R004)

- ① 合金层 Alloy Plate
- ② 保护 Overcoat
- ③ 标记 Marking
- ④ Sn 层 Solder Plating

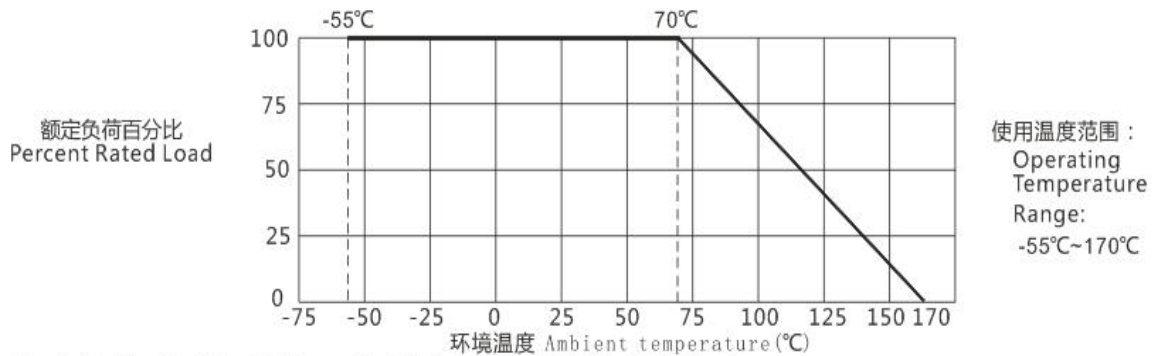
◆规格尺寸 Dimensions

型号 Type	阻值范围 Resistance Range (Ω)	阻值代号 Resistance code	L (mm)	W (mm)	T (mm)	D (mm)
2512	0.001-0.003	R001-R003	6.40±0.20	3.20±0.20	0.85±0.15	2.20±0.30
	0.004-0.010	R004-R010				1.05±0.25

注：产品采用符合高频应用的材料（如锰铜、卡玛），具备低寄生电感值。

Note: The product adopts materials that meet high-frequency applications (such as manganese copper, karma) with low parasitic inductance value.

◆产品特性曲线图 Product characteristic curve diagram



注：当电阻使用的环境温度超过70°C时，其额定负荷（额定功率）按上述曲线下降。

Note: For resistors operated in ambient over 70°C, rated load (rated power) shall be derated in accordance with the above figure.

◆额定值 Ratings

型号 Type	70°C下额定功率 Rating Power at 70°C (W)	元件极限电流 Limiting Element Current (A)	最大过负荷电流 Max. Over load Current (A)	阻值范围 Resistance Range (Ω)
2512	2、3	54.77	122.47	0.001
		38.73	86.60	0.002
		31.62	70.71	0.003 ~ 0.004
		24.49	54.77	0.005 ~ 0.010

注 Note:

1. 电流为直流或交流有效值。

Current of DC or AC RMS value.

2. 额定电流 = $\sqrt{\text{额定功率} / \text{标称电阻值}}$ 或元件极限电流两者中的较小值。

$I = \sqrt{P/R}$ or Limiting element current whichever is lower.

I: 额定电流 Rated Current (A); P: 额定功率 Rated power (W); R: 标称阻值 Normal resistance (Ω)

◆额定值 Ratings

型号 Type	阻值范围 Resistance Range (Ω)	电阻温度系数 TCR (ppm/°C)			
		标称阻值允许偏差 Resistance Tolerance			
		±0.5%	±1%	±2%	±5%
2512	0.001	±75、±50	±75、±50	±75、±50	±75、±50
	0.002~0.010	±50	±50	±50	±50

◆可靠性测试方法 Characteristics

项目 Item	标准 Specifications	测试方法 (IEC 60115-1) Test Methods (IEC 60115-1)
高温存储 High Temperature Exposure (Storage)	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 3 / MIL-STD-202 Method 108 1000 小时 @ $T=170^{\circ}\text{C}$, 不通电。 1000 hours. @ $T=170^{\circ}\text{C}$. Unpowered.
温度快速变化 Rapid Change of Temperature	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 4/ JESD22 Method JA-104 -55°C (30 分钟)~常温(≤ 1 分钟)~155°C (30 分钟), 1000 个循环。 -55°C (30min)~normal temperature($\leq 1\text{min}$)~155°C (30min), 1000 cycles.
高温高湿 Biased Humidity	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 7/MIL-STD-202 Method 103 温度 85°C, 湿度 85%RH 的条件下施加 10%额定功率或元件极限电流 (取较小值), 放置 1000 小时。 85°C/85%RH. 1000 hours, Apply 10% of operating power or limiting element current whichever is lower.
工作寿命 Operational Life	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 8/ MIL-STD-202 Method 108 125°C $\pm 2^{\circ}\text{C}$, 1000 小时, 降额电流, 通 1.5 小时/断 0.5 小时。 125°C $\pm 2^{\circ}\text{C}$, 1000h, de-rated current for 1.5h ON/0.5h OFF.
耐溶剂 Resistance to Solvents	标志清晰, 无可见损伤 Clearly marked, No mechanical damage	AEC-Q200 Test 12/MIL-STD-202 Method 215 浸在三种溶剂 3min 后擦拭 10 次, 浸、刷共 3 回, 用水洗清洗剂进行清洗, 并在室温下对整个表面进行通风干燥。 Immersed in three solvents after 3min immersion, brush wipe 10 times, a total of 3 times, washing with washing and cleaning agent, room temperature on the surface of the ventilation drying.
机械冲击 Mechanical Shock	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 13/MIL-STD-202 Method 213 正半弦波, 峰值加速度: 100g's, 脉冲持续时间: 6ms, 三轴六向各 3 次, 共 18 次。 Positive half wave, peak acceleration: 100g's, pulse duration: 6ms, three axis six to each 3 times, a total of 18 times.
振动 Vibration	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 14/MIL-STD-202 Method 204 频率: 10Hz~2000Hz, 加速度: 5 g's, 一个循环 20min, X、Y、Z 三个方向每个方向 12 个循环, 共 36 个循环。 Frequency: 10Hz ~ 2000Hz, acceleration: 5 g's, a loop 20min, X, Y, Z three directions, each direction 12 cycles, 36 cycles.
耐焊接热 Resistance to Soldering Heat	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 15/MIL-STD-202 Method 210 270°C $\pm 5^{\circ}\text{C}$ 锡槽, 保持 10s $\pm 1\text{s}$ 。 Lead-free solder bath at 270°C $\pm 5^{\circ}\text{C}$ for 10s $\pm 1\text{s}$.
热冲击 Thermal Shock	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 16/MIL-STD-202 Method 107 -55°C (15 分钟)~常温(≤ 20 秒)~155°C (15 分钟), 300 个循环。 -55°C (15min)~normal temperature($\leq 20\text{s}$)~155°C (30min), 300 cycles.
可焊性 Solderability	无可见损伤 No mechanical damage 可焊面积 $\geq 95\%$ 95% Cover Min	AEC-Q200 Test 18/IEC 60115-1 11.1 245°C $\pm 5^{\circ}\text{C}$ 锡槽, 保持 3s $\pm 0.3\text{s}$ 。 Lead-free solder bath at 245°C $\pm 5^{\circ}\text{C}$ for 3s $\pm 0.3\text{s}$.
电阻温度系数 T.C.R	在规定值内 Within specified T.C.R	AEC-Q200 Test 19/IEC 60115-1 6.2 +20°C/+125°C/+20°C

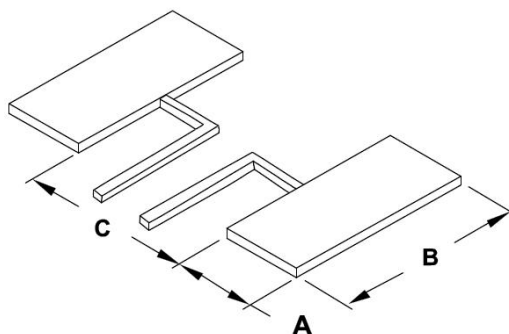
基板弯曲试验 Substrate Bending Test	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 21/AEC-Q200-005 弯曲距离(Bending distance): 2mm。 保持时间(Duration): 60s \pm 5s.
端子强度 Terminal Strength	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	AEC-Q200 Test 22/AEC-Q200-006 施加力: 17.7N, 保持 60s \pm 1s。 Applying force 17.7N for 60s \pm 1s.
可燃性 Flammability	不完全燃尽, 薄垫纸应不被引燃, 松木板应不被烤焦炭化 No ignition of the tissue paper or scorching or the pinewood board	AEC-Q200 Test 20/UL-94 V-0 或 V-1 可接受。不需要电气测试 V-0 or V-1 are acceptable. Electrical test not required.
短时间过负载 Short Time Overload	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	IEC 60115-1 8.1 5 倍额定功率, 保持 5 秒。 5 \times Rated Power , for 5 s .
低温负载 Operation at Low Temperature	无可见损伤 No mechanical damage $\Delta R \leq \pm 1.0\%R$	IEC 60115-1 10.2 -55 $^{\circ}$ C \pm 5 $^{\circ}$ C, 无负载 1 小时, 额定电流或元件极限电流 (取较小值) 45 分钟, 无负载 15 分钟。 -55 $^{\circ}$ C \pm 5 $^{\circ}$ C, 1h without load , rated current or limiting element current whichever is lower for 45min, 15min without load

◆ 包装 Packaging

包装方式见附录 Packaging can refer to the appendix

附录 Appendix I

◆推荐焊盘尺寸 Solder pad dimensions

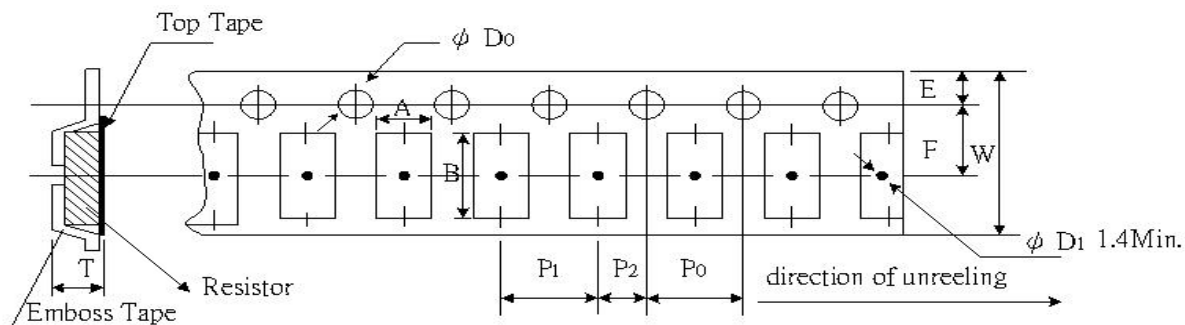


型号 Type	A (mm)	B (mm)	C (mm)	备注
2512	3.00±0.25	3.60±0.25	1.30±0.13	R001-R003
	1.80±0.25	3.60±0.25	3.80±0.13	R004-R010

◆包装 Packaging

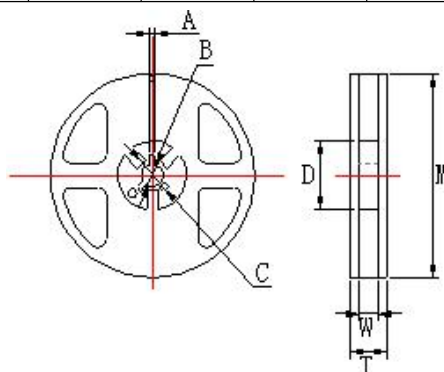
* 适用于 2512 规格

For 2512:



型号 Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P ₀ (mm)	P ₁ (mm)	P ₂ (mm)	ØD ₀ (mm)	T (mm)	Quantity (PCS)
2512	3.50±0.20	6.80±0.20	12.0±0.20	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.10	1.50±0.10	1.20±0.15	4000

* 卷盘 Reel



单位 unit: mm

卷盘尺寸 Reel Type	型号 Type	M	W	T	A	B	C	D
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7 英寸 7 inch dia.Reel	2512	178±2.0	13.0±0.5	15.5±1.5	2.0±0.5	13.0±0.5	21.0±0.5	57.0±2.0
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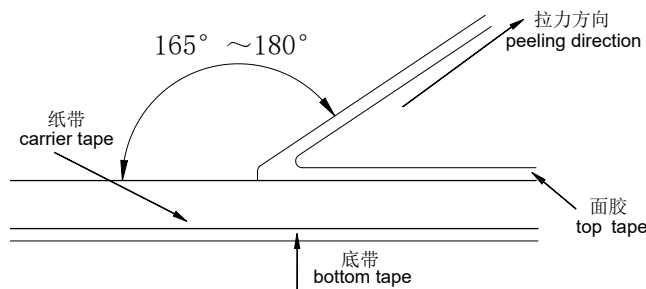
◆编带包装能力 Taping Ability

面带拉力 Top tape peel strength

面带拉力强度为 11g~70g (0.1N~0.7N) , 速度: 300mm/min, 经下列试验后不允许有破裂断带现象。

Peel strength is 11g~70g (0.1N~0.7N),with speed of 300mm/min,and should not have flash and tear after peeling.

测试方法 Test method:



电阻松动自如, 无粘面胶带、底胶带现象。

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

电阻易从纸带中取出, 且晶片孔无机械损伤。

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

◆包装数量 Packaging Quantity

包装方法 Packaging style	7 英寸 7inch dia.Reel
型号 Type	2512
数量 Quantity (pcs)	4000

◆储存方法 Storage method

温度 5℃~30℃, 相对湿度 30% RH~70% RH。建议在符合上述储存条件下十二个月内使用。

T: 5℃~30℃,RH: 30%RH~70%RH.The products are suggested to be used within twelve months when received, and the storage condition mentioned above should be followed.

◆电流检测电阻阻值代码及标记规则

Description for resistance Value Code and Marking of Current Sensing Thick Film Chip Resistor

* 阻值代码 Resistance Value Code

所有电流检测电阻全尺寸统一采用四位数阻值代码表示。

All resistance value code of current sensing thick film chip resistor used four digits.

例 Example

AMGN12XR001FTD

四位数代号表示, 如: R001=1mΩ

To use four digits codes represent resistance value,

例 Example R001=1mΩ

* 标记 Marking

*E-24 和 E-96 系列 ($2512 \leq \pm 5\%$) : 采用四位标记代码。

For ($2512 \leq \pm 5\%$) , when resistance value belongs to E24 and E96 series, we suggest preferentially use four digits.

标记代码 Mark Code	阻值范围 Resistance Value	示例 Sample
R00×	$1\text{m}\Omega \leq R \leq 9\text{m}\Omega$	R001=1m Ω
R0×	R=10m Ω	R010=10m Ω

*非 IEC 标准系列的电阻标记表示方法：一般以最接近 IEC E24 系列标称阻值的标记表示方法。

For the resistance values 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.

◆片式电阻器使用说明 Chip Resistor Instructions For Use

*本产品以下特殊环境下应用，性能可能会受到影响：

- 1、在各种类型的液体，包括水、油、化学品、有机溶剂的使用。
- 2、在户外直接暴露在阳光的地方，或在灰尘多的地方使用。
- 3、在产品暴露的地方，有海风或腐蚀性气体，包括氯气、硫化氢、氨气、二氧化硫、二氧化氮。
- 4、在产品暴露于静电或电磁波的地方使用。
- 5、在产生热量的部件、塑料线，或其他易燃物品附近使用。
- 6、在用树脂或其他涂层材料密封产品的情况下使用。
- 7、焊接后使用不洁焊料或使用水或水溶性清洗剂清洗产品。

* Application of the products in a special environment can deteriorate product performance:

- 1、Use in various types of liquid, including water, oils, chemicals, and organic solvents.
- 2、Use outdoors where the products are exposed to direct sunlight, or in dusty places.
- 3、Use in places where the products are exposed to sea winds or corrosive gases, including Cl_2 , H_2S , NH_3 , SO_2 , and NO_2 etc.
- 4、Use in places where the products are exposed to static electricity or electromagnetic waves.
- 5、Use in proximity to heat-producing components, plastic cords, or other flammable items.
- 6、Use involving sealing or coating the products with resin or other coating materials.
- 7、Use involving unclean solder or use of water or water-soluble cleaning agents for cleaning after soldering.

◆使用前的注意事项 Precautions before use

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- 2、在户外直接暴露在阳光的地方，或在灰尘多的地方使用。
- 3、在产品暴露的地方，有海风或腐蚀性气体，包括氯气、硫化氢、氨气、二氧化硫、二氧化氮。
- 4、在产品暴露于静电或电磁波的地方使用。
- 5、在产生热量的部件、塑料线，或其他易燃物品附近使用。
- 6、在用树脂或其他涂层材料密封产品的情况下使用。
- 7、焊接后使用不洁焊料或使用水或水溶性清洗剂清洗产品。

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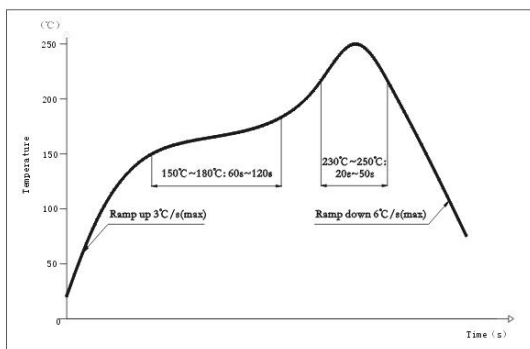
- 1、避免采用超过正常额定功率的功率，超过额定功率的稳态负载条件下可能会对产品性能和可靠性产生负面影响。
- 2、用镊子拿起产品时要小心，有可能会将保护或电阻体夹碎。
- 3、手动安装产品时，烙铁头勿触碰产品。
- 4、用于车载设备、医疗设备、航空设备以及其他涉及人身安全、或可能引起重大损失的设备上时，请务必事先与我公司联系。这些产品在这类用途中出现故障或失灵可能导致人身事故或严重损坏。

* Precautions on use of products

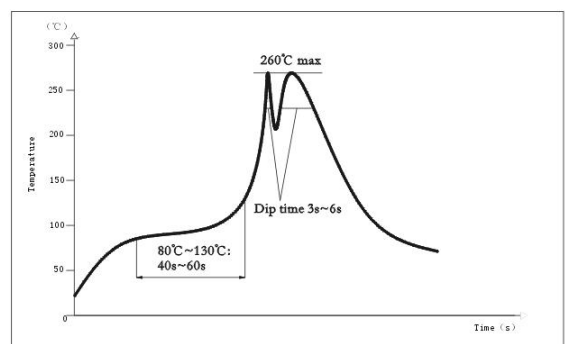
- 1、Avoid applying power exceeding normal rated power, exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 2、Be careful when pick up the products with tweezers. There may be a care that the overcoat and / or the body can be chipped.
- 3、Soldering tip shall not touch the product when install product manually.
- 4、Contact our sales representatives before you use our products for applications including automotive, medical equipment and aerospace equipment. Malfunction or failure of the products in such applications may cause loss of human life or serious damage.

◆推荐安装/焊接方法 Recommended installation/welding method

* 推荐的回流焊曲线 Recommended reflow profile



* 推荐的波峰焊曲线 Recommended wave solder profile



* 推荐的焊膏类型 Recommended solder alloy: 96.5Sn-3.0Ag-0.5Cu

◆修改履历 Revision history

版本 Version	日期 Date	修订内容 Change Description	修订确认 Checked by
I 1.0	2025-09-04	-附录：修改储存方法。 - Appendix: Modify the storage conditions.	刘瀚阳 Hanyang Liu
I 0	2025-08-21	原版 The original version	何国强 Guoqiang He

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