




规格承认书

SPECIFICATION FOR APPROVAL

客户名称 Customer	
客户料号 Customer P/N	
型号规格 Product Type	SMRH3D28-220M(f)
拟 制 Prepared By	
审 核 Checked By	
批 准 Approved By	
签发日期 Issued Date	2024-05-27

我们已确认承认书中的产品特性和要求

We have confirmed the product features and requirements in this specification.

客户确认

Customer Approved Signature

请认真阅读承认书的相关内容，将确认签名后承认书回传给我们。

Please read the relevant contents of this specification carefully and return one duplicate of this product specification to us with your signature to acknowledge your receipt.

如果在收到承认书后 1 个月内没有回传承认书，则视为贵公司已默认接受。

If the duplicate of this specification is not returned within 1 month of receipt, the product specification will be deemed to have been received by your company.

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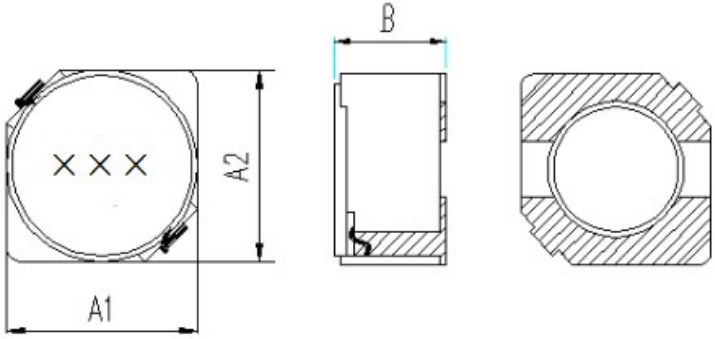
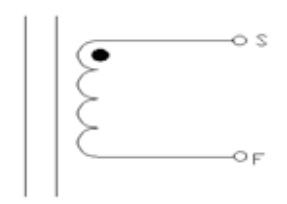
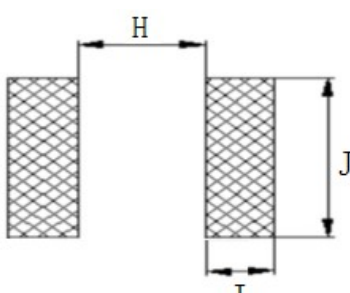
1 产品命名 PRODUCT IDENTIFICATION

SMRH 3D28 - 220 M (f)

① ② ③ ④ ⑤

①系列代号 Series Code	SMRH
②外形尺寸(mm) External Dimensions(mm)	长度×宽度×高度
③标称电感量 Nominal Inductance	220: 22μH
④电感量偏差 Inductance Tolerance	M: ±20%
⑤无有害物质产品 Hazardous Substance Free Products	(f)

2 外形结构及尺寸 APPEARANCE AND DIMENSIONS

外形结构 APPEARANCE			单位(UNIT): mm	电气特性图 SCHEMATICS OF ELECTRICAL CHARACTERISTICS		
						
				推荐焊盘 RECOMMENDED PAD		
						
系列 Series	A	B	C	H	I	J
SMRH3D28	3.8±0.3	3.8±0.3	3.2±0.3	1.5	1.5	4.5
主要材料 Main Materials	铁氧体磁芯 Ferrite Core、漆包铜线 Copper Wire、锡合金 Tin Alloys					

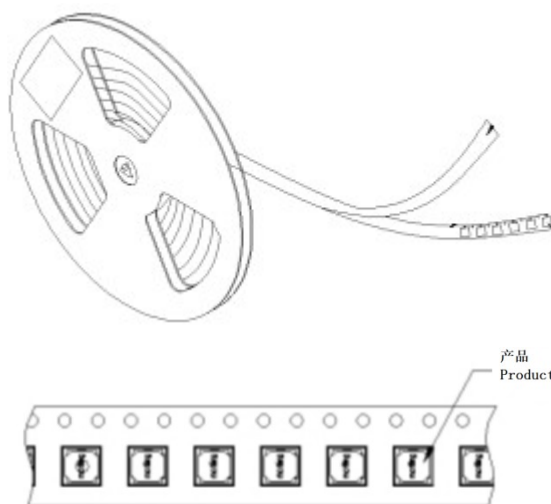


3 电气特性 ELECTRICAL CHARACTERISTICS

型号规格 Product Type	电感量 L Inductance ±20%	测试条件 Test Conditions	直流电阻 R _{DC} DC Resistance Max	额定电流 I _{DC} Rated Current
SMRH3D28-220M(f)	22	100 kHz/0.25V	335	0.68
单位 Units	μH	---	mΩ	A
测试仪器 Test Equipments	TH2828	---	TH2516	WK3260B
通用要求 General Requirements	工作温度 Operating temp.: -40℃~125℃	储存温度 Storage temp.: -40℃~85℃	储存相对湿度 Storage R.H.: 30%~70%	
	额定电流: 产品电感量相对于零电流时下降 20%时的直流电流值。 I _{DC} : The DC current value when the inductance of the product drops by 20% relative to the zero current.			

4 包装 Packaging

4.1 包装方式 Packaging Method



4.2 剥离强度要求 Peeling off Force of Cover Tape

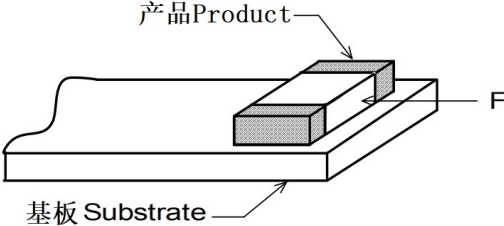
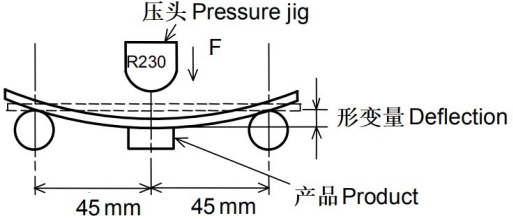
剥离力 Peeling off Force: 20~100g 剥离速度 Speed of Peeling off: 300mm/min 剥离角度 Angle of Peeling off: 165° ~180°	
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4.3 盘装数量 Reel Quantity

系列 Series	卷盘 Reel (PCS)
SMRH3D28	2000



5 可靠性 Reliability

项目 Items	要求 Requirements	试验方法及备注 Test Methods and Remarks
引出端强度 Terminal Strength	<p>无端电极剥离、断线或其它失效现象发生。 No removal or split of the termination or other defects shall occur.</p>  <p>产品 Product 基板 Substrate</p>	<p>按左图将电感器焊接于试验板上 Soldering the inductor on the testing Substrate (glass epoxy board shown as the left figure) by using eutectic solder.</p> <p>按左图施加作用力 Apply a force as the left figure.</p> <p>作用力 Force: 2.5N 持续时间 Duration: 10s</p>
弯曲 Bending Test	<p>外观无可见机械损伤。 No visible mechanical damage.</p>  <p>压头 Pressure jig R230 F 形变量 Deflection 45 mm 45 mm 产品 Product</p>	<p>按左图将电感器焊接于试验板上 Soldering the inductor on the testing Substrate (glass epoxy board shown as the left figure) by using eutectic solder.</p> <p>施加作用力速度 Speed of Applying Force: 0.5mm/s 形变量 Deflection: 2mm 持续时间 Duration: 30s</p>
振动 Vibration	<p>外观无可见机械损伤。 No visible mechanical damage.</p>	<p>振动频率 Oscillation Frequency: 10Hz to 2000Hz to 10Hz, 20 min; 振幅或加速度 Total amplitude or Acceleration: 3.0 mm , 245m/s²; 方向 Direction: X、Y、Z; 每个方向试验时间 Each Direction Testing Time: 4h</p>
可焊性 Solderability	<p>端电极表面至少覆盖 90%新焊料。 The surface of the terminal electrode shall be covered with at least 90% new solder.</p>	<p>方法：采用浸焊试验 Method: The test samples shall be dipped in flux, and then immersed in molten solder.</p> <p>预热 Pre-Heating: 150℃ ± 10℃ / 60s~90s 焊接温度 Soldering temp.: 245 ± 5℃ 浸锡时间 Immersion Time: 3 ± 1s 焊料 Solder: 96.5Sn/3.0Ag/0.5Cu 助焊剂 Flux: 25%松香 rosin, 75%乙醇 ethanol 浸锡深度 Immersion depth: 焊锡应浸没端电极 All sides of the terminal electrode shall be immersed.</p>



项目 Items	要求 Requirements	试验方法及备注 Test Methods and Remarks
耐焊接热 Resistance to Soldering Heat	外观无可见机械损伤; No visible mechanical damage; 电感量变化率 Inductance change rate: $\pm 30\%$.	方法: 采用浸焊试验 Method: The test samples shall be dipped in flux, and then immersed in molten solder 焊接温度 Soldering temp.: $260 \pm 5^\circ\text{C}$ 浸锡时间 Duration: $10 \pm 1\text{s}$ 焊料 Solder: 96.5Sn/3.0Ag/0.5Cu 助焊剂 Flux: 25%松香 rosin, 75%乙醇 ethanol 浸锡深度 Immersion depth: 焊锡应浸没端电极 All sides of the terminal electrode shall be immersed.
温度冲击 Thermal Shock	外观无可见机械损伤; No visible mechanical damage; 电感量变化率 Inductance change Rate: $\pm 20\%$.	温度及时间 Temperature and time: $-40 \pm 3^\circ\text{C}$, 30min; $125 \pm 3^\circ\text{C}$, 30min 转换时间 Transforming interval: $\leq 20\text{s}$ 循环次数 Cycle Times: 100 测量恢复时间 Test Recovery Time: $24\text{h} \pm 2\text{h}$
耐湿 Humidity Resistance	外观无可见机械损伤; No visible mechanical damage; 电感量变化率 Inductance change Rate: $\pm 30\%$.	温度 Temperature: $40 \pm 2^\circ\text{C}$ 湿度 Humidity: 90~95%RH 时间 Duration: $100 \pm 4\text{h}$ 测量恢复时间 Test Recovery Time: $24\text{h} \pm 2\text{h}$
高温贮存 High Temperature Storage	外观无可见机械损伤; No visible mechanical damage; 电感量变化率 Inductance change Rate: $\pm 30\%$.	试验温度 Temperature: $125 \pm 2^\circ\text{C}$ 时间 Duration: $100 \pm 4\text{h}$ 测量恢复时间 Test Recovery Time: $24\text{h} \pm 2\text{h}$
低温贮存 Low Temperature Storage	外观无可见机械损伤; No visible mechanical damage; 电感量变化率 Inductance change Rate: $\pm 30\%$.	温度 Temperature: $-40 \pm 3^\circ\text{C}$ 时间 Duration: $100 \pm 4\text{h}$ 测量恢复时间 Test Recovery Time: $24\text{h} \pm 2\text{h}$
寿命 Life	外观无可见机械损伤; No visible mechanical damage; 电感量变化率 Inductance change Rate: $\pm 30\%$.	温度 Temperature: $85 \pm 3^\circ\text{C}$ 施加电流 Applied current: $I_{\text{rms}}/I_{\text{DC}}$ 时间 Duration: $1000 \pm 24\text{h}$ 测量恢复时间 Test Recovery Time: $24\text{h} \pm 2\text{h}$



附件 1：电感器焊接及安装注意事项

Annex 1: Inductors Soldering and Mounting Precautions

1-1 焊接方式 Soldering Methods

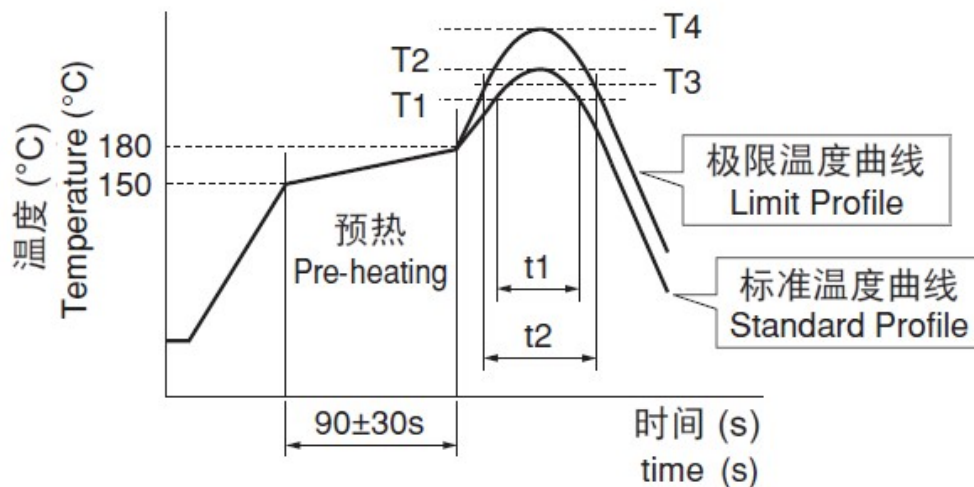
- (a) 贴片电感器推荐使用回流焊。
Reflow soldering is recommended for Chip Inductors.
- (b) 插件电感器推荐使用波峰焊或者烙铁焊。
Flow soldering or soldering iron is recommended for through-hole Inductors.
- (c) 条件限制时除外。
Except for limited conditions.

1-2 焊接原材料 Soldering Materials

- (a) 焊料：推荐使用 96.5Sn/3.0Ag/0.5Cu 焊料，或者采用 Sn 含量不超过 97% 的锡合金焊料。
Solder: It is recommended to use 96.5Sn/3.0Ag/0.5Cu solder, or use Tin alloy solder with a Tin content not exceeding 97%.
- (b) 助焊剂：推荐使用松香类助焊剂，请勿使用强酸性助焊剂（含氯量超过 0.2wt %），并且请勿使用水溶性助焊剂。
Flux: It is recommended to use rosin-based flux. Acidic flux (with chlorine content exceeding 0.2wt %) and water-soluble flux are forbidden.

1-3 焊接温度及要求 Soldering Temperature & Requirements

- (a) 回流焊 Reflow Soldering



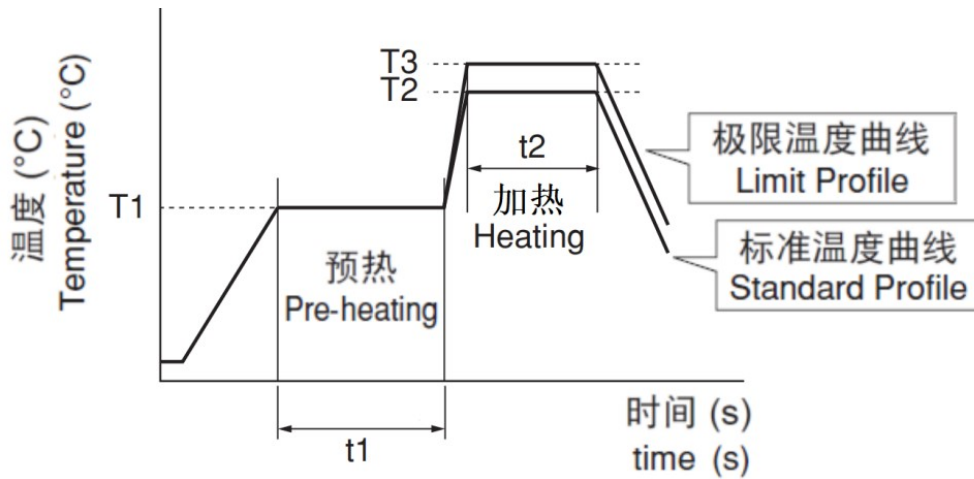
回流焊温度曲线 Reflow Soldering Temperature Profile

回流焊要求 Reflow Soldering Requirements

标准温度曲线 Standard Profile				极限温度曲线 Limit Profile			
加热 Heating		峰值温度 Peak Temp. (T2)	回流焊次数 Cycle Of Reflow	加热 Heating		峰值温度 Peak Temp. (T4)	回流焊次数 Cycle Of Reflow
加热 Temp. (T1)	时间 Time (t1)			温度 Temp. (T3)	时间 Time (t2)		
220°C	30~60s	245±3°C	≤2	230°C	≤60s	260°C/10s	1



(b) 波峰焊 Flow Soldering



波峰焊温度曲线 Flow Soldering Temperature Profile

波峰焊要求 Flow Soldering Requirements

预热 Pre-heating		标准温度曲线 Standard Profile			极限温度曲线 Limit Profile		
		加热 Heating		波峰次数 Cycle Of Flow	加热		波峰次数 Cycle Of Flow
温度 Temp. (T1)	时间 Time (t1)	温度 Temp. (T2)	时间 Time (t2)		温度 Temp. (T3)	时间 Time (t2)	
150°C	≥60s	250°C	4s~6s	≤2	265±3°C	≤5s	1

(c) 烙铁焊 Soldering Iron

推荐使用恒温电烙铁进行焊接，焊头工作部分最大直径不宜超过 5 毫米。

It's recommended to use a constant temperature soldering iron, the maximum diameter of the soldering iron end tip should not exceed 5 mm.

焊接温度根据焊料和实际情况确定，最高温度不宜超过 380°C。

The temperature of soldering iron is determined according to the solder and the actual situation, and the maximum temperature should not exceed 380 °C.

单次焊接时间应控制在 3 秒以内。

The single soldering time should be controlled within 3 seconds.

重焊或者重复焊接时，需先在 150°C 条件下预热 1-2 分钟。

When resoldering or repeating the soldering, it is necessary to preheat for 1-2 minutes at 150 °C.

烙铁头不能直接接触元件焊盘以外的部分。

Do not directly touch parts other than soldering pads with soldering iron tip.

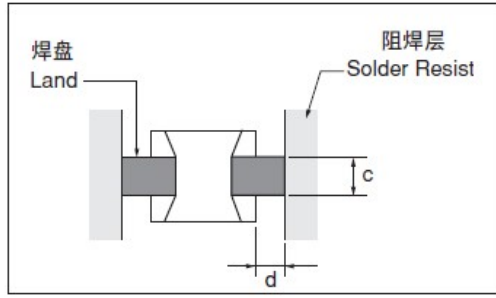
1-4 安装说明 Mounting instructions

(a) 焊盘布局尺寸 Pad Dimensions

过大焊盘会降低安装后的电感器 Q 值。同时，过大焊盘面积（图中线划分部分“c”和“d”）还会造成电极浮悬和电极浸出。请采用推荐焊盘，否则电感器性能可能发生变化或者在焊接过程中出现位置偏移。

Too large a pad can degrade the inductor Q value after installation. At the same time, too large a pad area (the line division sections "c" and "d" in the figure) will also cause electrode floating and electrode leaching. Use the recommended pads, otherwise inductor performance may change or position shifts may occur during the soldering process.





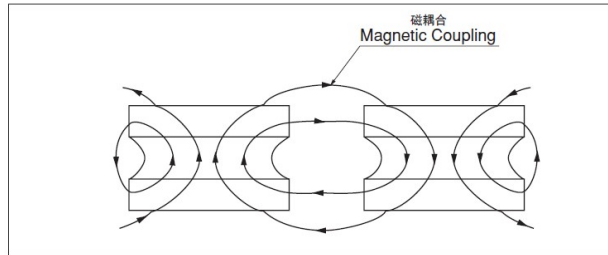
焊盘布局图

Pad Sketch

(b) 磁耦合 Magnetic Coupling

由于一些电感器的结构如同开放磁路，电感器之间的间距过窄可能会导致磁耦合，如下图所示，因此建议使用耦合系数小的电感器。

Since some inductors are structured like open magnetic circuits, too narrow a spacing between inductors may cause magnetic coupling, as shown in the figure below, so it is recommended to use inductors with small coupling coefficients.



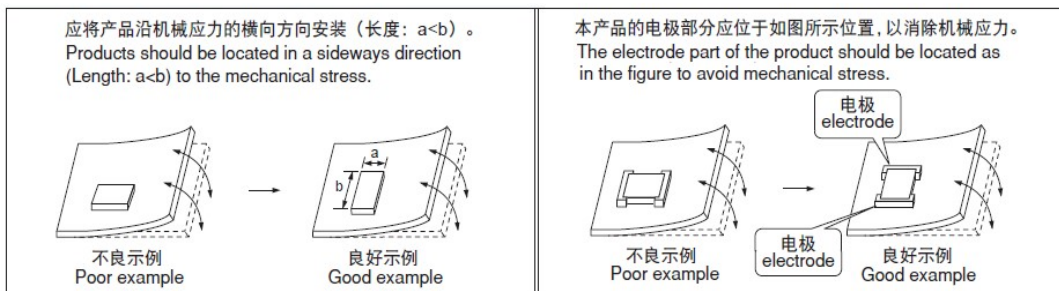
磁耦合示意图

Magnetic Coupling Sketch

(c) PCB 设计 PCB Design

PCB 板需合理设计，使产品不会因板的翘曲而承受机械应力。

PCB needs to be reasonably designed so that the product will not be subjected to the mechanical stress due to warpage of the board, as shown in the figure below.



PCB 设计示意图

PCB Design Sketch

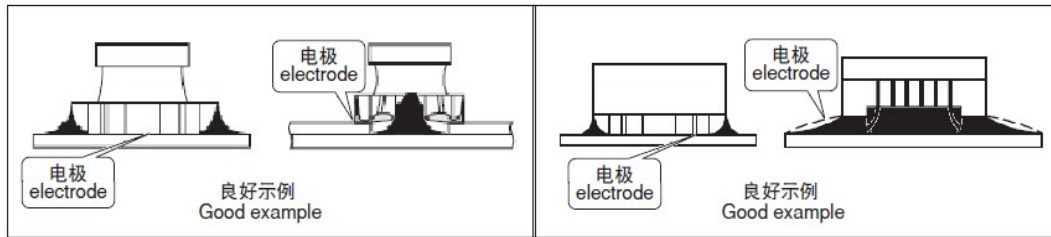
(d) 绑定胶量 Amount of Adhesive

电感器安装后有振动等特殊使用条件时，需对电感器进行粘绑定。如果绑定胶使用过多，可能会溢出流入到焊盘或电极处，造成可焊性降低。反之，如果绑定胶用量不足，或者绑定胶没有充分固化，电感器可能就会在后续试验中脱落，绑定如下图所示。

When the inductor needs to be used in special conditions such as vibration after it is installed, it is necessary to bond the inductor with adhesive. If too much adhesive is applied, then it may overflow



into the pad or electrode areas and cause poor solder ability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the inductors may become detached during flow test. The application method of adhesive is shown in the figure below.



绑定示意图

Adhesive Sketch

1-5 清洗 Cleaning

清洗时应遵循以下条件：

The following conditions should be observed when cleaning:

电装后建议采用喷淋清洗方式，请勿使用超声清洗。

It is recommended to use spray cleaning method after soldered. Do not use Ultrasonic cleaning.

清洗温度应不高于 60°C（使用醇类有机溶剂时应在 40°C 以下）。

Cleaning temperature shall be limited to 60°C max. (40°C max for alcohol cleaning agents).

确保彻底清除残留助焊剂，用去离子水清除水溶性清洗液后，应使电感器完全干燥。

To ensure that flux residue is completely removed. Inductors should be thoroughly dried after it has been removed with deionized water.





附件 2：最小起定量和其他要求

Annex 2: Minimum Order Quantity and Other Requirements

系列 Series	包装 Packing	最小起定量 Minimum Order Quantity	外箱 Outer Case
SMRH3D28	卷盘 Reel	2000 PCS	纸箱 Carton



警告 Caution	限制使用 Limitation of Applications
<p>若将本目录中的产品用于需要极高可靠性以防直接危及第三方生命、身体或财产的下列用途时，或当其中产品用于本目录规定以外的用途时，请提前与我公司联系。</p> <p>Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.</p>	<p>飞机设备 Aircraft equipment</p> <p>运输设备(汽车、火车、船舶等)Transportation equipment (vehicles, trains, ships, etc.)</p> <p>宇航设备 Aerospace equipment</p> <p>交通信号设备 Traffic signal equipment</p> <p>海底设备 Undersea equipment</p> <p>防灾、预防犯罪设备 Disaster prevention / crime prevention equipment</p> <p>电厂设备 Power plant control equipment</p> <p>数据处理设备 Data-processing equipment</p> <p>医疗设备 Medical equipment</p> <p>与上述用途具有类似复杂性或有可靠性要求的其它用途。</p> <p>Other applications of similar complexity or reliability requirements to the above use.</p>

