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## 1. 通则 General Characteristics

### 1.1 应用范围 Application range:

此产品规格书适用于轻触开关 1TS028A-1800-0600。

This product specification is applied to the 1TS028A-1800-0600 push-on type tact switch.

### 1.2 使用环境条件 Acclimatization:

使用温度范围 Operating Temperature range: -40℃~85℃

保存温度范围 Preservative Temperature range: -40℃~85℃

### 1.3 测试条件 Test Conditions:

若没有特别说明,则试验条件如下:

Unless otherwise specified, the atmospheric conditions for making measurements and tests are as follows:

温度 Temperature: 5~35℃

相对湿度 Relative Humidity:25~85%

气压 Air pressure:86~106Kpa

如对判定产生疑义, 则试验按以下条件进行:

However, if doubt arises on the decision based on the measured values under the above mentioned conditions, the following conditions shall be employed:

温度 Temperature:20±2℃

相对湿度 Relative Humidity:65±5%

气压 Air pressure:86~106Kpa

## 2. 外观和安装尺寸 Appearance & Mounting Dimensions:

### 2.1 外观 Appearance:

产品外观良好,无破损、锈蚀、裂纹和镀层缺陷。

The switch shall have good finishing, and no rust, crack or plating defects.

### 2.2 安装尺寸 Mounting dimensions:

应符合产品外形图 1TS028A 的要求。

Refer to product appearance drawing No.:1TS028A.

## 3. 驱动方式 Operate Mode:

按钮式 Push-on types.

## 4. 回路方式 Circuit Mode:

如成品图 1TS028A 所示(as assembly drawing 1TS028A).

## 5. 额定负荷及寿命 Rating and Operating life.

额定负载 Rating: DC 1V, 10 μA (min.)

额定负载 Rating: DC 12V, 50mA (max.)

负荷寿命 Operate Life With Load: 300,000cycles.



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## 6. 电气性能 Electrical Characteristics

### 6.1 外观检查 Visual Examination

| 测试条件 Test Method/Condition  | 标准 Criteria  |
|---|--|
| 产品未受力的情况下进行外观检查。<br>By Visual Examination choke without any out Pressure & testing. | 产品无明显缺陷,不影响使用<br>There shall be no defects that affect the serviceability of the product.<br>Visual inspection samples shall be free from defect such as damage, deformation, blister and burrs that are detrimental to the function and appearance. |

### 6.2 镀层结合力测试

| 测试条件 Test Method/Condition  | 标准 Criteria   |
|---|---|
| 胶带测试法: 用钢刀划出不少于 3 条平行线, 然后用粘结强度不小于 45g/mm 的 3M 胶带拉表面镀层 (内部弹片和焊脚都需要测试)。<br>By Visual Examination choke without any out Pressure & testing. | 在40倍显微镜下镀层无起皮、起泡、裂纹、脱落现象。<br>There shall be no defects that affect the serviceability of the product. |

### 6.3 接触电阻 Contact Resistance

| 测试条件 Test Method/Condition  | 标准 Criteria   |
|---|---|
| 开关在无电气负荷状态下, 动作 3 次以上后, 用接触电阻测试仪器测量各接点的接触电阻。<br>Switch without load, operate more than 3 times, use contact resistance testing apparatus to test the contact resistance of each point of contact. | 常态 Normal<br>500mΩ max<br>气候及寿命试验后 after weather and life proof:<br>1000 mΩ max |

### 6.4 绝缘电阻 Insulation resistance

| 测试条件 Test Method/Condition  | 标准 Criteria |
|---|-------------|
| 在相互绝缘的端子之间加载 100VDC , 持续时间 60 ±5 S。<br>100VDC Voltage is applied between terminals frame for 60 ± 5S. | 100MΩ min.  |

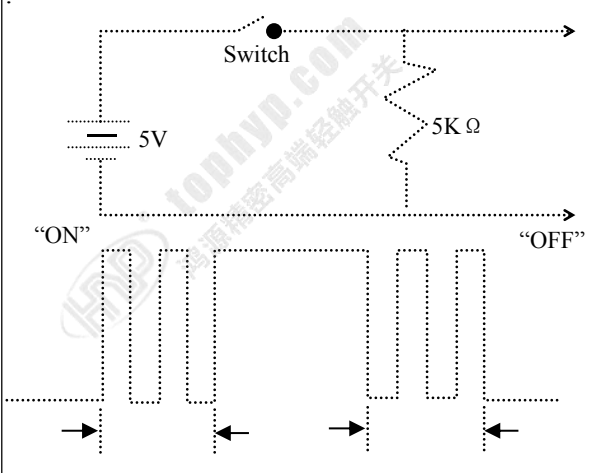


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### 6.5 抗电强度 Dielectric strength

| 测试条件 Test Method/Condition  | 标准 Criteria  |
|---|--|
| <p>在相互绝缘的所有接线端子之间加载 250VAC (泄漏电流应不超过 0.5mA )的交流电,持续时间 <math>60 \pm 5</math> S。</p> <p>250VAC (leak current 0.5mA max ) alternate current load is applied between open terminals connected with wires, for <math>60 \pm 5</math>S.</p> | <p>无击穿和飞弧现象, 无绝缘破坏。</p> <p>No dielectric breakdown shall occur, no insulation destruction.</p> |

### 6.6 弹跳 Bounce

| 测试条件 Test Method/Condition   | 标准 Criteria   |
|--|---|
| <p>使用规格书上2倍按压力来按压开关, 每秒按压3-4次。记录开关导通和断开过程的时间<math>t_{s1}</math>和<math>t_{s2}</math>。</p> <p>Press the center of operating part at the speed of 3-4 times per second, and measure bounce at ON and OFF.</p>  | <p>初态(initial): 10ms max.</p> <p>测试后 (包括环境和机械测试): 20ms max.</p> |

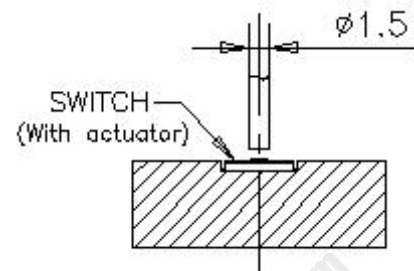
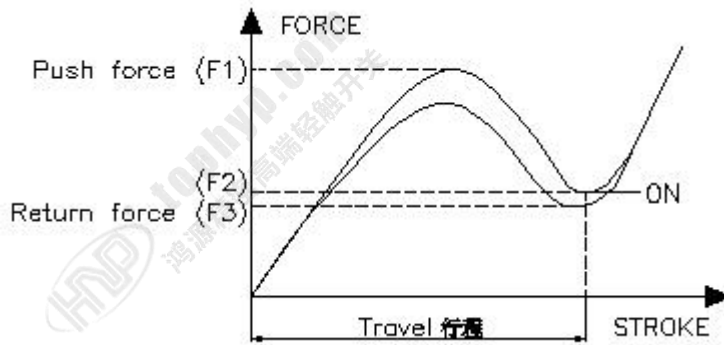


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## 7. 机械性能 Mechanical Characteristics

### 7.1 操作力、回弹力&手感 Push force 、 Return force& Click ratio

| 测试条件 Test Method/Condition  | 标准 Criteria          |                                |
|---|----------------------|--------------------------------|
| 两倍的作动力按压switch中心，速度12.5mm/min<br>Double operating force by vertically pressing down the center of push button gradually until it stops.<br>moving speed at 12.5mm/min | FP<br>(Push force)   | 炉前：180±30gf<br>炉后：200±30gf     |
| 两倍的作动力按压switch中心，速度12.5mm/min<br>Double operating force by vertically pressing down the center of push button gradually until it stops.<br>moving speed at 12.5mm/min | FR<br>(Return force) | 30gf min.                      |
| 参考下面曲线图。<br>Refer to the nether graph.<br>Click ratio = $(F1-F2)/F1 \times 100\%$   | CR<br>(Click ratio)  | 炉前：40% min.<br>三次回流焊后：40% min. |



### 7.2 行程 Travels

| 测试条件 Test Method/Condition  | 标准 Criteria |
|---|-------------|
| 两倍的作动力按压switch中心，速度12.5mm/min<br>Double operating force by vertically pressing down the center of push button gradually until it stops.<br>moving speed at 12.5mm/min | 0.13±0.05mm |



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### 7.3 正向静压测试 Stopper strength

| 测试条件 Test Method/Condition   | 标准 Criteria  |
|--|--|
| 对产品施加5kgf按压力保持15秒。<br>Double operating force by vertically pressing down the center of push button | 无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。<br>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine. |

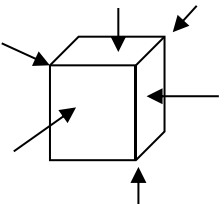
### 7.4 振动 Vibration Proof

| 测试条件 Test Method/Condition   | 标准 Criteria  |
|--|--|
| 开关采用常规安装方法牢固地安装在试验设备上，按下述参数进行试验：<br>1) 振频:10~55HZ<br>2) 振幅:1.52 mm<br>3) 振动变化速率:10~55~10HZ 大约 1 分钟<br>4) 变频方法:对数或线形方式<br>5) 振动方向:三个互相垂直的方向，其中一个方向为操作元件运动的方向<br>6) 时间: 每个方向 2 小时 (共 6 小时)。<br>Switch shall be secured to a testing machine by a normal mounting device and method, Switch shall be measured after following test:<br>1)Vibration frequency range:10~5HZ<br>2)Total amplitude:1.5mm<br>3) Sweep ratio:10~55~10Hz,Approx 1 minute<br>4) Method of changing the sweep vibration frequency : logarithmic or linear<br>5) Direction of vibration : Three perpendicular directions including actuating direction.<br>6) Duration : 2 hours(6hours in total) | 无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。<br>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine. |



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### 7.5 冲击 Impact shock test

| 测试条件 Test Method/Condition  | 标准 Criteria  |
|---|--|
| 1) 加速度 Acceleration: 490m/S <sup>2</sup><br>2) 作用时间:6ms<br>3) 冲击次数: 六个方向 3 次, 共 18 次<br><br>1) Acceleration: 490m/S <sup>2</sup><br>2) Acting time:6ms<br>3) Cycle of test: 3 cycles each in 6 directions, for a total 18 cycles.<br><br> | 无机械和电气损伤。符合第 6.3 – 6.6 项和第 7.1 – 7.2 项要求。<br><br>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine. |

### 7.6 Top switch触点侧向推力强度测试 Side pressure strength of actuator

| 测试条件 Test Method/Condition   | 标准 Criteria  |
|--|--|
| 对触点x/y四个方向施加外力, 推力不小于500gf, 速度12.5mm/min。<br>Plunger push to side surface of actuator at horizontal direction as plunger<br>Push force:500gf min<br>moving speed at 12.5mm/min | Top Switch 四个方向推力不小于5N, 开关触头无脱落或变形; 开关触点和膜不偏位, 无破损开裂。<br>机械和电气性能满足规格要求 (符合第6.3 – 6.6 项和第7.1 – 7.2项要求)<br>four directions(X/Y) of Actuator<br>Push force:5N min<br>No mechanical damage to component.<br>Electrical and mechanical meet the specification requirements. ( item 6.3 - 6.6 and item 7.1-7.2 ) |





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## 8 耐久性试验 Durability Characteristics

### 8.1 寿命试验 Operating Life

| 测试条件 Test Method/Condition  | 标准 Criteria  |
|---|--|
| <p>在额定负荷的条件下，在寿命测试设备上连续转换 300,000 次，频率:120 次/分钟，操作力为:600±100gf。</p> <p>300,000 cycles of operation shall be performed continuously with load at a rate of 120 cycles per minute, Push force: 600±100gf.</p> | <p>1) 动作力: 初始值的±30%。<br/>Operating force : within ±30% initialization value.</p> <p>2) 无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。<br/>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine.</p> |

## 9 耐候试验 Weather Proof Characteristics

### 9.1 耐低温 Resistance Low Temperature

| 测试条件 Test Method/Condition   | 标准 Criteria  |
|--|--|
| <p>试件在-40±2℃的温控箱内保持 96 小时，然后在正常温度和湿度下恢复 1 小时，并在此后的 1 小时内对试件进行测量，水滴应消失。</p> <p>After testing at -40±2℃ for 96 hours, the switch shall be allowed to stand under normal temperature and humidity conditions for 1 hour, and measurement shall be made with 1 hour after that, water drops shall be eliminated.</p> | <p>无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。<br/>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine.</p> |



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### 9.2 耐热性 Heat Resistance

| 测试条件 Test Method/Condition   | 标准 Criteria   |
|--|---|
| <p>试件在 85±2℃ 的温控箱内保持 96 小时，然后在正常温度和湿度下恢复 1 小时，并在此后的 1 小时内对试件进行测量，水滴应消失。</p> <p>After testing at 85±2℃ for 96 hours the switch shall be allowed to stand under normal temperature and humidity conditions for 1 hour and measurement shall be made with 1 hour after that, water drops shall be eliminated.</p> | <p>无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。</p> <p>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine.</p> |

### 9.3 恒定湿热 Humidity Resistance

| 测试条件 Test Method/Condition  | 标准 Criteria   |
|---|---|
| <p>试件在 60±2℃, 90~95%RH 的温控箱内保持 96 小时，然后在正常温度和湿度下恢复 1 小时，并在此后的 1 小时内对试件进行测量，水滴应消失。</p> <p>After testing at 60±2℃,90~95%RH for 96 hours ,the switch shall be allowed to stand under normal temperature and humidity conditions for 1 hour, and measurement shall be made within 1 hour after that .Water drops shall be eliminated.</p> | <p>无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。</p> <p>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine.</p> |

### 9.4 盐雾 Salt spray

| 测试条件 Test Method/Condition   | 标准 Criteria   |
|--|---|
| <p>1) 测试时间: 48小时</p> <p>2) 测试温度湿度: 35°±2°c, 湿度 95~98%</p> <p>3) Salt NaCl mist 5%</p> <p>测试后用水冲洗连接器，然后放在室温下静置16小时</p> <p>1) Time of test: 48 hour</p> <p>2) temp:35° ±2° c R/H 90-95%</p> <p>3) Salt NaCl mist 5%</p> <p>After test wash parts and return to room ambient for 16hours.</p> | <p>无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。</p> <p>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine.</p> |



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## 10 保护结构 Protection

### 10.1 防尘保护 Dust Protection

IP6X相当 IP6X equivalent

| 测试条件 Test Method/Condition  | 标准 Criteria   |
|---|---|
| 开关按下述参数条件进行试验:<br>1) 滑石粉量: 2 kg/m <sup>3</sup><br>2) 测试时间: 8 h<br>3) 试验后, 试件外部粉尘应去除。<br>Switch shall be checked after following test:<br>1) Amount of talc: 2 kg/m <sup>3</sup><br>2) Time of test: 8 h<br>3) Dusts shall be removed. | 1) 开关内不能有粉尘浸入。<br>No penetration of dusts shall be found inside of switch.<br>2) 无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。<br>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine. |

### 10.2 防水保护 Water Protection

IPX8相当 IPX8 equivalent

| 测试条件 Test Method/Condition  | 标准 Criteria  |
|---|--|
| 开关按下述参数条件进行试验:<br>1) 浸泡深度: 1.5 m<br>2) 浸泡时间: 30 分钟 min<br>3) 试验后, 试件外部水滴应去除。<br>Switch shall be checked after following test:<br>1) Depth of immersion: 1.5 m<br>2) Duration of immersion : 30 minute min<br>3) Water drops shall be removed. | 1) 开关内不能有明显的水渍浸入影响产品性能。<br>No outstanding penetration of water which effects the functionality.<br>2) 无机械和电气损伤。符合第 6.3 - 6.6 项和第 7.1 - 7.2 项要求。<br>The switch shall be free from abnormalities in electric and mechanism. According to item 6.3 - 6.6 and item 7.1-7.2 to examine. |



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## 11 焊接性能 Solder-ability requirement

### 11.1 沾锡测试 Surface Mount Solder-ability Test

| 测试条件 Test Method/Condition  | 标准 Criteria  |
|---|--|
| <p>用锡膏将开关安装在 PCB 上，回流过程 2 次，焊接温度参考如下 IR 图表。</p> <p>Mount the switch on PCB by solder paste, reflow process 2 times, refer to the nether Soldering Temperature IR chart.</p> | <p>除了端子的裁切面外，所有样品的焊脚沾锡面积至少95%。</p> <p>At least 95% of immersed area should be adequately wetted on all samples except on cutting edge of terminal.</p> |
|   |  |

### 11.2 过炉测试 Resistance to Reflow Soldering Heat

| 测试条件 Test Method/Condition  | 标准 Criteria   |
|---|---|
| <p>测试样品需过炉三次</p> <p>参考第11.1项炉温曲线，不带锡膏，不使用氮气。</p> <p>The unmated DUT should withstand three immediately followed reflow processes meet item 11.1 IR curve.</p> <p>Nitrogen is not allowed for this test.</p> <p>Number of reflows should meet at least 3 cycles.</p> | <p>产品功能ok</p> <p>电气性能ok</p> <p>产品过炉后无任何变形，尺寸仍需满足规格要求</p> <p>The functional and electrical requirements still fulfilled.</p> <p>No deformation of component after reflow on any side of the component.</p> |



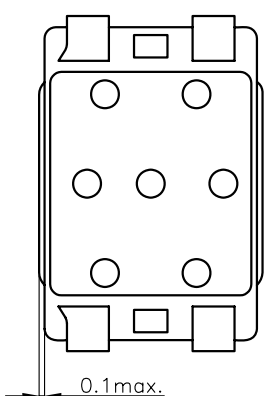
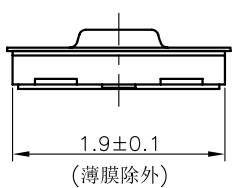
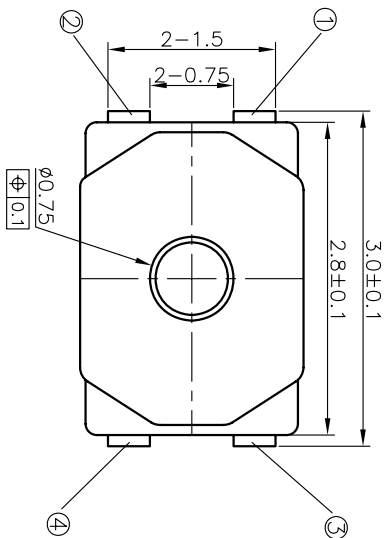
|  |  |                                    |      |          |      |   |
|--|--|------------------------------------|------|----------|------|---|
| 文件名称<br><b>DOCUMENT NAME:</b><br>PRODUCT SPECIFICATION | 主 题 SUBJECT:<br>2.8X1.9 TACT SWITCH<br>1TS028A-1800-0600 | 文件编号 DOCUMENT NO.:<br>EB1-AS1C-177 | PAGE | 13 OF 13 | REV. | A |
|--|--|------------------------------------|------|----------|------|---|

### 11.3 爬锡&锡渗透 Flux resistance / penetration

| 测试条件 Test Method/Condition  | 标准 Criteria  |
|---|--|
| 测试样品需过炉三次<br>参考第11.1项炉温曲线。<br>The component should withstand three immediately followed item 11.1 IR curve. | 不允许助焊剂和锡膏侵入到端子接触部位。<br>产品功能OK<br>电气性能ok<br>No flux or solder ingress into contact area.<br>The functional and electrical requirements fulfilled. |

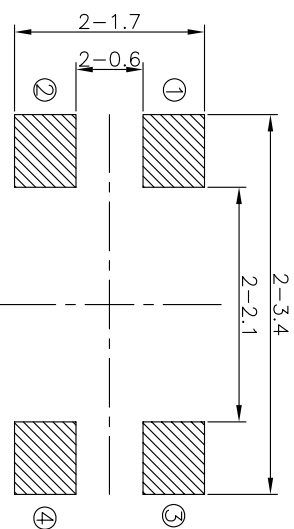
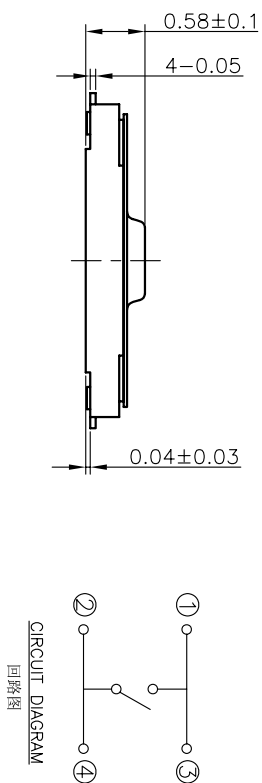
### 11.4 焊接强度Solder peel off strength

| 测试条件 Test Method/Condition  | 标准 Criteria   |
|---|---|
| 柱塞推到开关侧面（开关X/Y侧面）<br>移动速度为5毫米/分钟<br>推力：15N<br>Plunger push to side surface of switch（X/Y side surface of switch）<br>moving speed at 5mm/min | 产品无机械损伤<br>电气性能满足规格要求。<br>1.Top Switch four directions(X/Y)<br>Push force:15N min<br>2.Side switch F1 direction Push force:50N min<br>3.Side Switch other three direction :30N min<br>No mechanical damage to component.<br>Electrical performance still within requirements. |



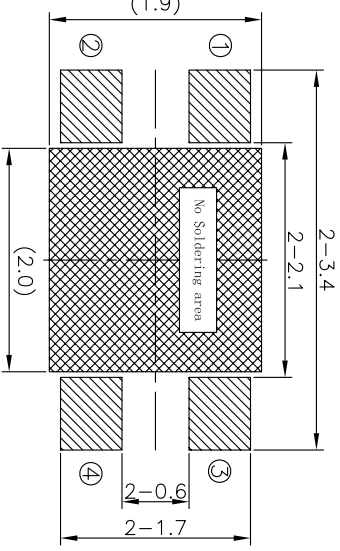
规格 Specifications

|                            |                          |
|----------------------------|--------------------------|
| 额定负荷 Rating                | DC 12V/50mA              |
| 接触电阻 Contact Resistance    | 500mΩ max.               |
| 绝缘电阻 Insulation resistance | DC100V 60S 100MΩ min.    |
| 抗电强度 Dielectric strength   | AC250V(50-60HZ) 60S min. |
| 操作力 Operation force        | ≥100±30gf<br>≤190±30gf   |
| 寿命试验 Operating Life        | 300,000 cycles           |
| 行程 Travels                 | 0.13±0.05mm              |



LAND PATTERN PLAN

印刷电路板焊盘参考图



PRODUCT NO.: 1TS028A\*\*\*-060\*\*

- 轻触开关: 2.8X1.9系列
- 外形: A=四脚 B=四脚无按柄
- 按点颜色: 底座颜色: 贴膜颜色:
- 操作力度: 100=100gf, 160=160gf, 225=225gf
- 手感: 0=常规(弹片), 1=大手感(弹片), 2=小手感(弹片), 3=特殊手感(弹片)
- 材质: 0=初始材质, 1=新增材质, 3=3个弹片依次增加
- 其它: CT=编带(非编带, 不启用)

| ITEM | PART NAME | QUANTITY | MATERIAL        | FINISH    |
|------|-----------|----------|-----------------|-----------|
| 5    | KNOB      | 1        | POLYAMIDE       | BLACK     |
| 4    | FILM      | 1        | POLYAMIDE       | WHITE     |
| 3    | DOME      | 2        | SUS301          | Ag-PLATED |
| 2    | HOUSING   | 1        | POLYAMIDE       | BLACK     |
| 1    | TERMINAL  | 1        | PHOSPHOR BRONZE | Ag-PLATED |

|              |                |        |    |
|--------------|----------------|--------|----|
| X. ± 0.2     | X' ± 0.2'      | UNITS  | MM |
| .X ± 0.1     | X' ± 0.1'      | MAT'L  |    |
| .XX ± 0.01   | .XX' ± 0.01'   | FINISH |    |
| .XXX ± 0.002 | .XXX' ± 0.002' |        |    |

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|                        |                  |
|------------------------|------------------|
| NAME(INTENDED USE)     | HON YUAN         |
| 2.8X1.9 SERIES         |                  |
| TACT SWITCHES          |                  |
| PART NO.(INTENDED USE) | 1TS028A***-060** |
| APPD:                  | ZO 1/9/2019      |
| CHKD:                  | M.H.Li 1/9/2019  |
| DR:                    | WP.Lu 1/9/2019   |
| DWG NO.:               | 1TS028A          |

|             |      |
|-------------|------|
| SCALE SHEET | 25/1 |
| REV.        | A    |

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