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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 1TS016A-2200-***0。

This product specification is applied to the 1TS016A-2200-***0 push-on type tact switch.

1.2 使用环境条件 Acclimatization:

使用温度范围 Operating Temperature range: -40℃~90℃

保存温度范围 Preservative Temperature range: -40℃~90℃

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 1TS016A 的要求。

Refer to product appearance drawing No.: 1TS016A.

3. 驱动方式 Operate Mode:

按钮式 Push-on types.

4. 回路方式 Circuit Mode:

如成品图 1TS016A 所示(as assembly drawing 1TS016A).

5. 额定负荷及寿命 Rating and Operating life.

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
产品在未受力的情况下进行外观检查。 By Visual Examination choke without any out Pressure & testing.	产品无明显缺陷,不影响使用 There shall be no defects that affect the serviceability of the product.

6.2 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。 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 500mΩ max 气候及寿命试验后 after weather and life proof: 1000 mΩ max

6.3 绝缘电阻 Insulation resistance

测试条件 Test Method/Condition	标准 Criteria
在相互绝缘的所有端子之间及各接线端子与外露的非载流金属零件之间加载 100VDC , 持续时间 60 ±5 S。 100VDC Voltage is applied between each pair of terminals and between the terminal and the metal frame for 60±5S.	常态 Normal 100MΩ min 气候及寿命试验后 after weather and life proof: 10MΩ min

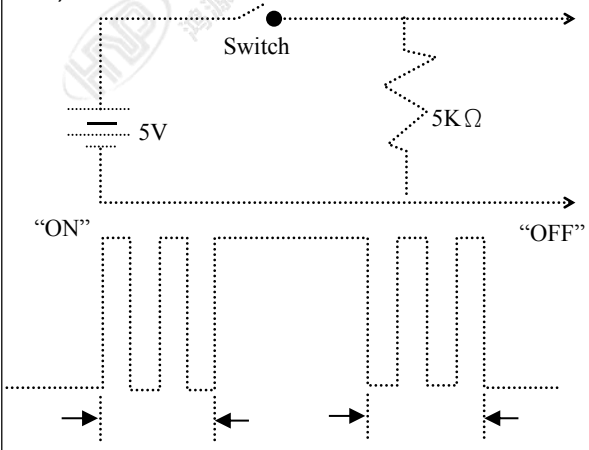


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6.4 抗电强度 Dielectric strength

测试条件 Test Method/Condition	标准 Criteria
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 60±5 S。 250VAC (leak current 0.5mA max) alternate current load is applied between open terminals connected with wires, for 60±5S	无击穿和飞弧现象。 No dielectric breakdown shall occur.
各接线端子与金属铁壳之间加载 250VAC (泄漏 电流应不超过 0.5mA) 交流电,持续时间 60±5 S。 250VAC (leak current 0.5mA max) alternate current load is applied between terminal and metal cover, for 60±5S.	无击穿和飞弧现象。 No dielectric breakdown shall occur.

6.5 弹跳 Bounce

测试条件 Test Method/Condition	标准 Criteria
开关在正常的操作条件下 (3~4 次/秒) , 测试通 断弹跳时间。 Lightly striking the center of the stem at a rate encountered in normal use (3 to 4 operations per sec.) bounce shall be tested at 'ON' and 'OFF'. 	10 m seconds max



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7. 机械性能 Mechanical Characteristics

7.1 操作力&回弹力 Operation force & Return force

测试条件 Test Method/Condition	标准 Criteria	
在操作按钮末端沿操作方向均匀施加静载荷至行程末端,量测最大力度 A static load shall be applied to the tip of actuator in operating direction. Measure the maximum force during all the travel.	FP	220±40gf
在操作按钮末端沿操作方向均匀施加静载荷,量测按钮返回过程中最小力度 A static load shall be applied to the tip of actuator in operating direction. Measure the minimum force during actuator return.	FR	40gf min.

△ FORCE

FP

FR

FP: PEAK FORCE
FR: RETURN FORCE
 $C/R = (F_P - F_R) / F_P * 100\%$

TRAVEL(mm)

7.2 行程 Travels

测试条件 Test Method/Condition	标准 Criteria
开关发生转换后,操作组件末端与初始位置之间的距离。 Distance from the end of operating component to the start position when switch is being transformed	0.15±0.05mm

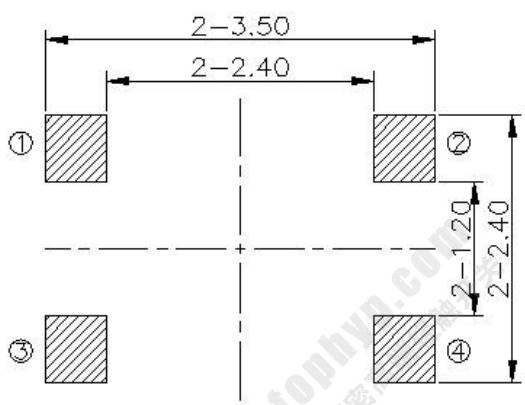


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7.3 操作件强度 Operating Part Strength

测试条件 Test Method/Condition	标准 Criteria
置开关于正常安装位置, 在操作件中心施加与操作件动作相反方向的 300gf 静负荷, 时间为 60 S。 Put the switch in the normal gearing position, Bring 300gf pressure which direction is opposite to the actuator operates direction in the tip of the actuator center, time is 60S.	无机械和电气损伤。符合第 7.1 & 7.2 项要求。 The switch shall be free from abnormalities in electric and mechanism. According to item 7.1 & 7.2 to examine.

7.4 可焊性 Solder Ability

测试条件 Test Method/Condition	标准 Criteria
试件在下述条件下进行试验: 1) 设备: 自动焊接机。 2) 焊料: 常规 3) 焊剂: 焊剂, 质量百分比为 25% 松香, 75% 甲醇的无色透明溶液。 4) 焊接温度: $255 \pm 5^{\circ}\text{C}$ 5) 建议钢网厚度为 0.1mm, 所刷锡膏厚度 $\leq 0.12\text{mm}$ 。 6) 浸渍深度: 接线端应浸到开关根部处。 7) 禁止使用酒精, 汽油, 慢干水 (异佛尔酮) 等化学物品接触开关。 Switch shall be checked after following test: Solder trough test: 1) Equipment: Auto-Dip Chamber 2) Solder: Normal 3) Flux: Rosin Flux having a nominal composition of 25% solids by mass of water white rosin in methyl 4) Soldering Temperature: $255 \pm 5^{\circ}\text{C}$ 5) stencil thickness : 0.1mm , The thickness of the solder paste : $\leq 0.12\text{mm}$ 6) Immersion Depth: Immersion depth shall be at copper plating portion of PCB after mounting. 7) Prohibit contact items : alcohol , gasoline , Isophorone	超过 90% 的浸锡面积被焊料所覆盖。 More than 90% of immersed part shall be covered with solder. 建议钢网尺寸如下图所示:  Recommended PAD Layout ± 0.05 TOP VIEW



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7.5 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: 1) 振频:10~55HZ 2) 振幅:1.5 mm 3) 振动变化速率:10~55~10HZ 大约 1 分钟 4) 变频方法:对数或线形方式 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 6) 时间：每个方向 2 小时（共 6 小时） Switch shall be secured to a testing machine by a normal mounting device and method, Switch shall be measured after following test: 1) Vibration frequency range:10~5HZ 2) Total amplitude:1.5mm 3) Sweep ratio:10~55~10Hz, Approx 1 minute 4) Method of changing the sweep vibration frequency : logarithmic or linear 5) Direction of vibration : Three perpendicular directions including actuating direction.6) Duration : 2 hours(6hours in total)	符合第 6、第 7.1、7.2 条要求。 According to item 6 and 7.1、7.2 to examine.

7.6 冲击 Impact shock test

测试条件 Test Method/Condition	标准 Criteria
1) 加速度 Acceleration: 80G(784m/S ²) 2) 作用时间:6ms 3) 冲击次数：六个方向 3 次，共 18 次 1) Acceleration: 80G(784m/S ²) 2) Acting time:6ms 3) Cycle of test: 3 cycles each in 6 directions, for a total 18 cycles. 	符合第 6、第 7.1、7.2 条要求。 According to item 6 and 7.1、7.2 to examine.



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7.7 回流焊耐热实验 Reflow Soldering Heartest

测试条件 Test Method/Condition	标准 Criteria
焊接温度参考如下 IR 图表 TL(L)-6 Soldering Temperature: SEE IR chart	超过 66%的焊锡面积被焊料覆盖。 More than 66% of surface area of the portion immersed shall be covered with solder.
<p>The graph shows a temperature profile for reflow soldering. The y-axis represents temperature in degrees Celsius, with markers at Room Temperature, 150°, 180°, 230°, 255°, and MAX 260°. The x-axis represents time in seconds, with markers for 60~90sec, 40sec, 5~8sec, and 3~4 min. Max. The profile starts at Room Temperature, rises to 150°, then to 180°, and finally to a peak of MAX 260°C. The peak is maintained for 3 seconds. The temperature then drops, with a 40sec dwell at 230°C and a 5~8sec dwell at 180°C before returning to Room Temperature.</p>	



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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
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:60 次/分钟。操作力为规格值的最大值 300,000 cycles of operation shall be performed continuously cycles with load at a rate of 60 cycles per minute. Push force: Maximum value of operation force.	1) 动作力: 初始值的 $\pm 30\%$ 。 Operating force : within $\pm 30\%$ initialization value. 2) 接触电阻: 1000 m Ω Max Contact resistance 1000 m Ω Max 3) 绝缘电阻: 10M Ω min Insulation Resistance: 10M Ω min 4) 弹跳 10 ms max Bounce 10 m sec max

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
试件在 $-40\pm 2^{\circ}\text{C}$ 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。 After testing at $-40\pm 2^{\circ}\text{C}$ 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.	符合第 7.1 项要求 As shown in item 7.1



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9.2 耐热性 Heat Resistance

测试条件 Test Method/Condition	标准 Criteria
试件在 90±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。 After testing at 90±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.	符合第 7.1 项要求 As shown in item 7.1

9.3 恒定湿热 Humidity Resistance

测试条件 Test Method/Condition	标准 Criteria
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。 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.	1) 符合第 7.1 项要求 As shown in item 7.1 2) 接触电阻: 1000 mΩ Max Contact resistance 1000 mΩ Max 3) 绝缘电阻: 10MΩ min Insulation Resistance: 10MΩ min



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10 保护结构 Protection

10.1 防尘保护 Dust Protection

测试条件 Test Method/Condition	标准 Criteria
开关按下述参数条件进行试验: 1) 滑石粉量: 2 kg/m ³ 2) 测试时间: 8 h Switch shall be checked after following test: 1) Amount of talc: 2 kg/m ³ 2) Time of test: 8 h	1) 接触电阻: 500 mΩ Max Contact resistance 500 mΩ Max 2) 开关内不能有粉尘浸入。 No penetration of dusts shall be found inside of switch.

10.2 防水保护 Water Protection

测试条件 Test Method/Condition	标准 Criteria
开关按下述参数条件进行试验: 1) 浸泡深度: 1 m 2) 浸泡时间: 30 分钟 min Switch shall be checked after following test: 1) Depth of immersion: 1 m 2) Duration of immersion : 30 minute min	1) 绝缘电阻: 100MΩ min Insulation Resistance: 100MΩ min 2) 开关内不能有明显的水渍浸入影响产品性能。 No outstanding penetration of water which effects the functionality.



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11 测试顺序 Test Sequence

测试项目 Test Description	测试组别 Test Group								Samples (n)
	A	B	C	D	E	F	G	H	Defective(C)
1.外观检查 Visual examination	1,10	1,9	1,13	1,13	1,13				n=5,C=0
2.操作力 Operating force	2,9	2,8	2,12	2,12	2,12				n=5,C=0
3. 回弹力 Return force	3,8	3,7	3,11	3,11	3,11				
4.接触电阻 Contact resistance	4,7	4,6	4,10	4,10	4,10				n=5,C=0
5.抗电强度 Dielectric strength			5,9	5,9	5,9				n=5,C=0
6.绝缘电阻 Insulation resistance			6,8	6,8	6,8				n=5,C=0
7.寿命试验 Operating Life		5							n=5,C=0
8.振动 Vibration Proof	6								n=5,C=0
9.冲击 Impact shock test	5								n=5,C=0
10.耐低温 Resistance Low Temperature			7						n=5,C=0
11.耐热性 Heat Resistance				7					n=5,C=0
12.恒定湿热 Humility Resistance					7				n=5,C=0
13.防尘保护 Dust Protection					8				n=5,C=0
14.防水保护 Water Protection					9				n=5,C=0



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12. 有害物质管控 Harmful material control

环保要求 ENVIRONMENT SPECIFICATION

下列 8 种环境有害物质禁止使用，其前处理方式及测试方法依据客户规定办理

1	鎘及其化合物 (Cadmium and cadmium compounds)
2	PBB (多溴聯苯)類 & PBDE (多溴化二苯醚)類 PBB (Polybrombiphenyl) category PBDE (PolyBrominated biphenyl ethers) category
3	多氯聯苯 (PCB)類 PCB (Polychlorinated biphenyl) category
4	多氯化奈類 Polychlorinated naphthalene categor
5	有機錫化合物 (三丁基錫類 & 三苯基錫類) Organic tin compounds (Tributyl tin category & Triphenyl tin category)
6	石棉 (Asbestos)
7	偶氮化合物 (Azo compounds) (可能分解 生成揮發胺，不允許使用於與人體持續接觸之部位)
8	FR-720 等溴素系難燃劑(CAS No. 21850-44-2)(FR-720 and similar flame retardant classified as CAS No. 21850-44-2)



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13. 其他注意事项 Other precautions

1.焊接后，不要使用溶剂或类似品清洗开关。

Following the soldering process,do not try to clean the switch with a solvent or the like.

2.防止助焊剂从开关的顶部渗入。

Safeguard the switch assembly against flux penetration from its top side.

3.采用手工焊接时，应在以下条件进行：1) 焊接温度 $\leq 350^{\circ}\text{C}$ ；2) 焊接时间 3 秒内。

Hand soldering ,should be practice according to below conditions:1) soldering temperature 350°C Max; 2) soldering time 3s Max.

4.保管时尤其应注意避开高湿高温和有腐蚀性气体的环境。常温、常湿中应在包装状态下进行保管，自交货起 6 个月以内为限度，请尽可能快地使用。用户应确认包装箱上的生产日期，采用先入先出库存管理法。在包装箱开箱并入库保管时，应放入塑料袋内与外部空气隔绝。

Preservation under high temperature and high humidity or corrosive gas should be avoided Especially.