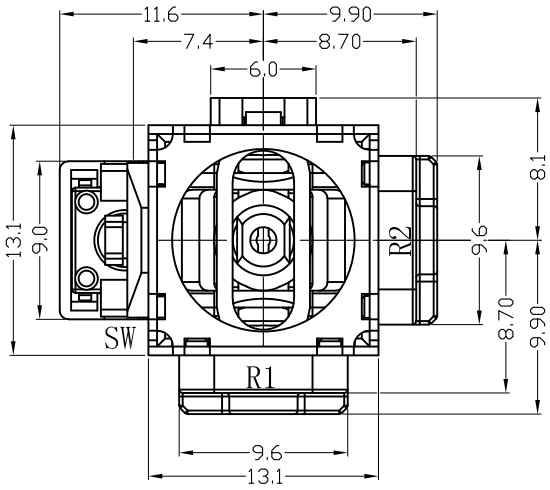
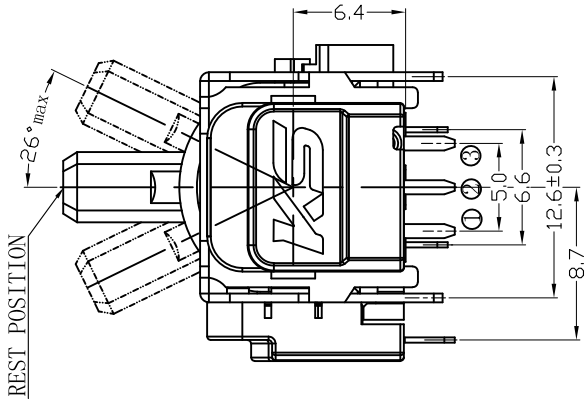
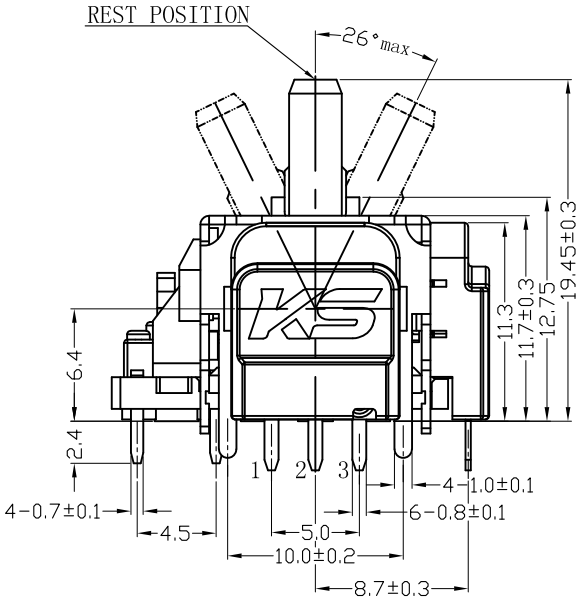
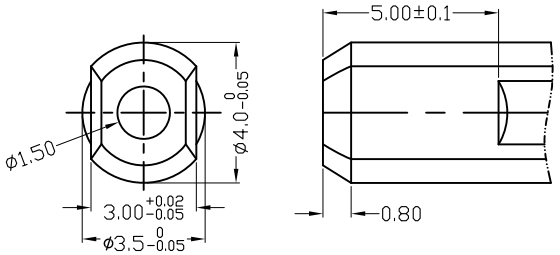








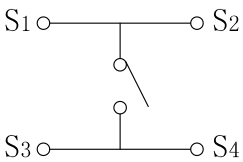
轴心部尺寸详图

2:1

Wiring method:

接线方式：

蓝色本体：	绿色本体：
PIN 1:GND	PIN ①:VCC
PIN 2:OUT	PIN ②:OUT
PIN 3:VCC	PIN ③:GND



CIRCUIT:SW

注意：1.基板板厚=1.2

RECOMMENDATORY THICKNESS OF P.W.B.IS 1.2mm

2.VR端子厚 t=0.3mm

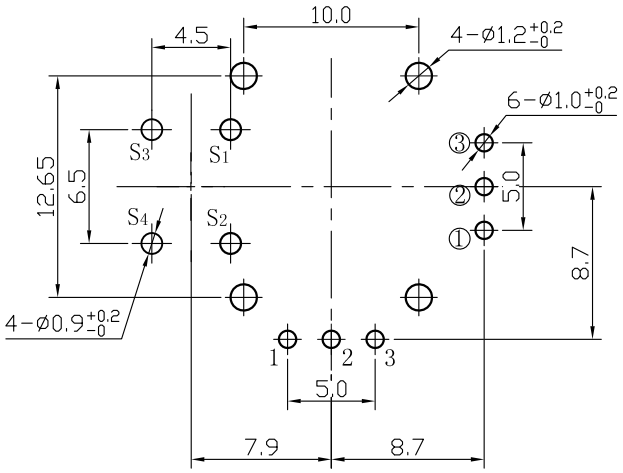
POT.TERMINAL THICKNESS

SW 端子板厚 t=0.3mm

SWITCH TERMINAL THICKNESS

外壳厚度 t=0.5mm

FPAME THICKNESS



P.C.B MOUNTING HOLE DETAIL

VERSION			MODEL: YTMR-YG13-006 SH3B174A4			DRAW	SCALE
A0	亚特联 YATELIAN		DRAWING NO: YTMR-YG13-006 SH3B174A4			洪晓亮	3:1
.ISSU.	DATE	REVISION	Design	TOL.UNLESS OTHERWISE SPEC.		CHKD	UNIT
00	2024.11.4	初始发行	洪晓亮	BASIC DIMENSIONS	TOL.	宋明士	mm
01				L≤10	±0.3		
02				10＜L	±0.5	APPD	
03				100≤L	±0.8	严治银	
04				ANGLE	±5°		第 1 页

日期:2024 年 11 月 4 日

1.General 一般事项

1-1 Scope 适用范围

This specification is applicable toTMR joystick used in electronic equipment. The device produces a linear response when the output voltage is within the specified voltage range. Outside this range, sensitivity is reduced and nonlinear

本规格书适用于电子设备使用之 TMR 摇杆。当输出电压在规定的电压范围内时，该装置产生线性响应。在这个范围之外，灵敏度会降低，并且是非线性的

1-2 Standard atmospheric conditions 标准大气状态

Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:

除另有规定外，量测应在以下大气条件下进行:

Ambient temperature 温度	: 15℃ ~ 35℃
Relative humidity 相对湿度	: 25% ~ 85%
Air pressure 气压	: 86 KPa~ 106 KPa

If there is any doubt about the results, measurements should be made within the following limits:

如有任何疑虑时，量测应在以下条件下进行:

Ambient temperature 温度	: 20℃ ± 1℃
Relative humidity 相对湿度	: 63% ~ 67%
Air pressure 气压	: 86 KPa~ 106 KPa

1-3 Operating temperature range 适用温度范围 : -10℃ ~ +70℃

1-4 Storage temperature range 保存温度范围 : -30℃ ~+80℃

1-5 Operators shall wear electrostatic bracelets during operation

作业员操作时需戴静电手环

2. Construction 构造

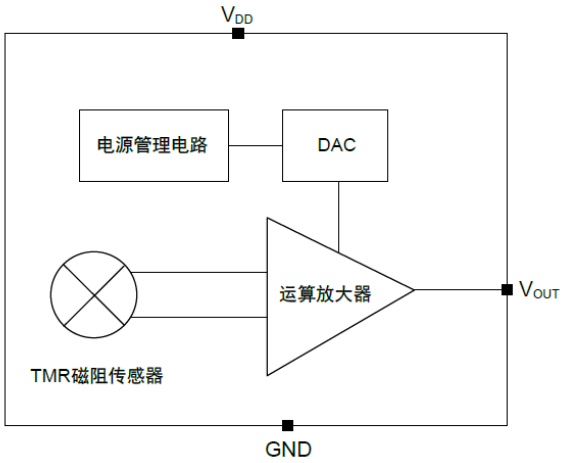
2-1 Dimension 尺寸 : Refer to attached drawing 参见成品图

3.Mechanical characteristics

机械性能

NO. 序号	ITEM 项　目	CONDITIONS 条件	SPECIFICATION 规格
1	Figure of lever operation 摇杆动作形式	/	Circular operating 圆形式
2	Operation angle of lever 摇杆使用有效角度	Add a fit force on the lever top to push it to max. angle of each direction when lever is released and reset position. 当摇杆处于自由复归位置时,在摇杆顶部施加一定力将摇杆推向任意方向最大角度。	26° max 最大 26°
3	Operating force of lever 摇杆作用力	Test position is at more than 10 degrees deflection of lever. 摇杆偏斜 10 度以上之位置测定。	120±40 gf
4	Accuracy of reset position of lever 摇杆复归垂直度	Measure the angle between the lever and the axial center line after the lever pushed to the direction of X-X(Y-Y) and resets. 摇杆推向 X-X(Y-Y)方向自由复归后测量摇杆与垂直中心线的角度。	90° ±3°
5	Knob strength 扭曲强度	Apply force on the lever perpendicular to the lever’s rotation direction. 旋转于摇杆的力作用于摇杆上	More than 3Kgf.cm 3 seconds min 大于 3Kgf.cm，至少 3 秒钟
6	The stopper strength of the lever 摇杆止动强度	Apply side force on the lever perpendicular to the lever’s axial direction. 垂直于摇杆的力作用于摇杆上。	More than 3Kgf 3 seconds min 大于 3Kgf，至少 3 秒钟
7	Pull strength of lever 摇杆拉拔强度	Apply specified push force on the lever downward. 作用于摇杆上，沿摇杆方向向上。	More than 5Kgf 3 seconds min 大于 5Kgf，至少 3 秒钟
8	Push Strength of lever 摇杆推强度	Apply side force on the lever perpendicular to the lever’s axial direction. 垂直于摇杆的力作用于摇杆下。	More than 10kgf 3 seconds min 大于 10Kgf，至少 3 秒钟
4. Electrical characteristics **电气特性**			

NO. 序号	ITEM 项　目	CONDITIONS 条件	SPECIFICATION 规格
1	Voltage Divider Error 分压误差值	Voltage divider error is defined the ratio of the voltage terminals 1-2 to terminals 1-3 after the drive arm rested. 1.8V & 3.3V D.C. shall be applied to the terminals between 1and 3 and then voltage divider error shall be measured with the drive arm operation on the line X-X and Y-Y. 分压误差值是摇杆自由复归后端子 1-2 与端子 1-3 电压比例.将 1.8V & 3.3V D.C 电 压加在端子 1-3 之间, 分压误差值在 摇杆运作于 X-X 和 Y-Y 方向到底复归后 测试.(端子 1-2/端子 1-3 ×100%	40.3%～59.7%
2	Limit voltage value 极限电压值	The limit voltage value is the voltage ratio between terminals 1-2 and 1-3 after the rocker reaches the bottom. Add 1.8V & 3.3V D.C voltage between terminals 1-3, and the limit voltage rocker operates in the x-x and Y-Y directions to the bottom 极限电压值是摇杆到底后端子 1-2 与端子 1-3 电压比例.将 1.8V & 3.3V D.C 电 压加在端子 1-3 之间, 极限电压摇杆运作于 X-X 和 Y-Y 方向到底测试.	At 23° Minimum value ＜ 26% and maximum value ＞74%. (value from the straight line to the edge in the up, down, left and right directions) 在 23° 时最小值＜26%,最大值＞74%。（上、下、左、右四个方向直线到边的值）

3	value of reset position 复归值	The absolute value of difference between the partial voltage error value measured after the free reset of the rocker in the upward direction and the partial voltage error value measured after the free reset of the rocker in the downward direction. The absolute value of difference between the partial voltage error value measured after the free reset of the rocker in the left direction and the partial voltage error value measured after the free reset of the rocker in the right direction 摇杆推向上方向自由复位后测得分压误差值与摇杆推向下方向自由复位后测得分压误差值之差的绝对值。摇杆推向左方向自由复位后测得分压误差值与摇杆推向右方向自由复位后测得分压误差值之差的绝对值.	Within 6.3%. 6.3%以内
4	Functional Block Diagram 功能图		

5 Electrical Specifications 电气规格

Symbol 符号	Parameters 参数	Test Condition 实验条件	Min 最小值	Typ 标准值	Max 最大值	Unit 单位
Vcc	Supply Voltage 电源电压		1.6	3.3	5	V
Icc	Supply Current 供电电流	Ta=25℃	-	200	-	uA
Tpo	Power on Time 开机时间	Ta=25℃	-	-	100	us
Bw	Bandwidth 带宽	-3dB, CL=1nF	-	-	50	KHz

		Rout	Output Resistance 输出电阻	Iout<1.5mA Vcc=3V B=0Gs	-	5	15	Ω
		RI	Output Loading Resistance 输出负载电阻	Pull to GND 下拉到 GND	10	-	-	KΩ
				Pull to VCC 上拉到 VCC	10	-	-	KΩ
		CI	Output Loading Capacitance 输出负载电容	Output to GND	-	-	10	nF
		RI	Output Loading Resistance 输出负载电阻	Iout<=1.5 mA Output to GND or to Vcc	3K	-	-	kohm
		VOL	Linear output low voltage 线性输出低电压	VCC=3V,RL>=4.7 KΩ	-	-	0.1	V
		VOH	Linear output high voltage 线性输出高电压	VCC=3V,RL>=4.7 KΩ	VCC-0.1	-	-	V
6	Magnetic Characteristics 磁特性	Symbol 符号	Parameters 参数	Test Condition 实验条件	Min 最小值	Typ 标准值	Max 最大值	Unit 单位
		ELin	Nonlinear error 非线性误差	Ta=25℃	-1.5	-	1.5	%
		VOE	Zero field output voltage error 零磁场输出电压误差	Vcc=1.8V;B=0 Ta=25℃	0.855	0.9	0.945	V
				Vcc=3V;B=0 Ta=25℃	1.57	1.65	1.73	V
		VOQ_TC	Zero field voltage output drift in temperature range 温度范围内零磁场电压输出漂移	-	-1.5	-	1.5	%

		SNST_TC	Magnetic sensitivity drift in temperature range 温度范围内磁灵敏度漂移	-	-	1000	-	ppm/℃
		ERAT_VOQ	Zero field output voltage proportional error 零磁场输出电压比例误差	Ta=25℃	-1.5	-	1.5	%
				Ta=25℃	-1.5	-	1.5	%
		ERAT_SNST	Proportional error of magnetic sensitivity 磁灵敏度比例误差	Ta=25℃	-2	-	2	%
				Ta=25℃	-2	-	2	%
		VN	Noise 噪声	Ta=25℃, Vcc=3.38V, BW=5kHz	-	-	10	mVpp
7	V ESD 耐静电	HBM	Human-body model(HBM) 人体模型	-	-	-	4	kV
		CDM	Charged-device model(CDM) 带电器件模型	all pin	-	-	500	V

5. Endurance characteristics
耐久性能

NO. 序号	ITEM 项 目	CONDITIONS 条件	SPECIFICATION 规格

1	Resistance to soldering heat 焊锡耐热性	Soldering test shall be using below materials. 使用以下材料进行焊锡试验。 Using printed: single sided Wiring board copper clad laminate 使用板子 t=1.2mm 单面铜箔玻纤板 Solder: Sn-Ag solder (Pb free) 半田：：Sn-Ag 材料 无 Pb Flux：specific gravity 0.82min. 助焊剂 ：比重 0.82 以上 Soldering condition is in this below. 如下焊锡条件进行试验。 Preheating: The surface of the solder side shall be heated 90℃ to 100℃,for 45 seconds or less. 预热温度：基板表面温度 90℃～100℃，45 秒以内。 Solder：The board shall be solderd up to the mounting side surface (but solder shall not come into the mounting side surface) for within 5seconds at 255℃ to 260℃. 焊锡：温度 255～260℃、５秒以下。焊锡面最大为 PCB 板的上面。 PCB 板表面无沾锡流动。 Flux :The foaming method shall be applied. Flux shall not come into the mounting side surface and fluxing time shall be 3seconds or less. 助焊剂： ３秒以内在 PCB 表面喷撒，PCB 板上助焊剂流动。 Soldering time: One time with above condition. 焊锡次数：按上记条件 1 次。	Not less than 95% of the surface dipped shall be covered with new solder. 浸锡部分表面最少 95%被新锡覆盖。
2	Dry heat 耐热性	Temperature:80±2℃ Time: 96 hours The controller shall be subjected to standard atmospheric conditions for 2 hours , after which measurement shall be made. 在温度 80±2℃恒温槽中放置 96 小时，取出后在正常状态下放置 2 小时后测试。	Without damage and lever deformation, Without the looseness and failing function of witch. 无不良性能产生,无松动及开关性能损坏。

3	Cold 耐寒性	Temperature:-30 ±2℃ Time: 96 hours Surface moisture shall be removed, and then the controller shall be subjected to standard atmospheric conditions for 2 hours, after which measurement shall be made. 在温度-30±2℃恒温槽中放置 96 小时，表面水份摄取后在正常状态下放置 2 小时后测试。	Without damage and lever deformation, Without the looseness and failing function of witch. 无不良性能产生,无松动及开关性能损坏。
4	Damp heat 耐湿性	Temperature: 60 ± 2℃ Humidity: 90~95%RH Time: 96 hours Surface moisture shall be removed. And then the controller shall be subjected to standard atmospheric conditions for 2hours,after which measurement shall be made. 在温度 60±2℃ 90%~95%RH 恒温槽中放置 96 小时，表面水份摄取后在正常状态下放置 2 小时后测试。	Without damage and lever deformation, Without the looseness and failing function of witch. 无不良性能产生,无松动及开关性能损坏。
5	Temperature cycling test 温度循环测试	Low temperature : -20±3℃ 30 minutes High temperature: +60±3℃ 30 minutes Number of cycles: 5 Surface moisture shall be removed, and then the controller shall be subjected to standard atmospheric conditions for 2 hours , after which measurement shall be made. 在低温为-20±3℃恒温槽放置 30 分钟,高温 60±3℃放置 30 分钟,测试 5 次，表面水份摄取后在正常状态下放置 2 小时后测试。	Without damage and lever deformation, Without the looseness and failing function of witch. 无不良性能产生,无松动及开关性能损坏。
6	Free falling 自由落下试验	Height: 75cm. Number of falls: 3 times 从高度为 75 厘米落下测试 3 次后。	Without damage and lever deformation, Without the looseness and failing function of witch. 无不良性能产生,无松动及开关性能损坏。
7	Number of cycles 耐久寿命	Mechanical life should be tested 5,000,000 cycles at the the speed of one cycle per second without electrical load when joystick rotate 360° at 26° position. 无负载状态下以 1 圈/秒速度将摇杆推至 26.0° 位置进行 360° 旋转测试，寿命 5,000,000 圈。	without mechanical malfunction 机械性能无异常

	Switch number of cycles 开关寿命	Under electrical load DC5V/5mA, compress 750gf force to the lever which is released and reset to vertical position. Switch life should be tested more than 1,000,000 cycles at the the speed of 2 cycles per second. 负载状态下(DC5V/5mA)，在摇杆自由复归后的垂直方向施加750gf的按压力，以2次/秒的速度对开关进行测试，寿命1,000,000次以上。	Contact resistance 200Ω Max, No mechanical malfunction. Be satisfied with 6.1 and 6.2 接触阻抗最大200Ω， 机械方面能动作(符合第6.1条和第6.2条)。

6.Switch characteristics (FOR WITH-SWITCH TYPE)

开关规格(适用于带开关机种)

NO. 序号	ITEM 项　目	CONDITIONS 条件	SPECIFICATION 规格
1	Operating force 作动力	Apply side force perpendicular to the lever's axial direction on the lever until the lever stops, measure the max force value. 将一个轴向力施加于摇杆上直到其不动为止,量取施力期间之最大值。	750±300 gf
2	Travel 移动量	Put the switch lever upward, apply 2 times of the static operating force over the lever's axial direction of the lever, measure the variance of the switch stroke. 将开关操作部位(摇杆)置于静止位置,并在操作柄中央施加两倍于作动力之静负荷测量柄被压到不动时之移动距离。	$0.4^{+0.5}_{-0.3}$ mm
3	Maximum Ratings 最大定格电压	Within 70℃ 70℃以内。	12 V DC 50 mA
4	Contact resistance 接触阻抗	Apply 2 times of the operating force of the static load on the vertical direction of the lever, measure the resistance by using the Contact Resistance Tester with 1KHZ, 20mV, 5~50mA of current. 将两倍于作动力之静负荷加于操作柄之中央以(1KHZ,20mV, 5~50mA)微电流接触阻抗计测定。	Less than 100 mΩ 低于100 mΩ

5	Insulation resistance 绝缘阻抗	A voltage of DC100V is applied between terminals. 以 DC100V 之电压加于端子间测定。	More than 100 MΩ 100 MΩ以上
6	Withstand voltage 耐电压	A voltage of AC 250V/2mA (50~60HZ) shall be applied for 1min between terminals. 以AC250V/2mA (50~60HZ)电压施加于端子间 1 分钟。	Without breakdown. 无绝缘破坏之现象。

Approved 核 准	Check 审 查	Design dept. 经 办 者
严治银	宋明士	洪晓亮