

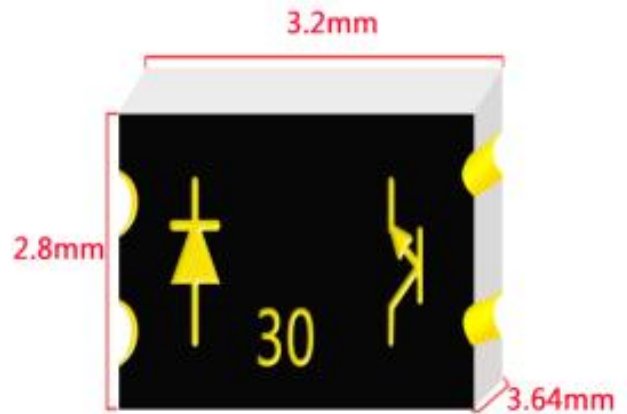
Data Sheet

规格书

KD1918S-30

**SMD Photoelectric Ball Tilt Switch for 360°
Omnidirectional Tip-over Detection**

贴片式光电滚珠倾斜开关 — 支持 360° 全
方位倾倒检测



Description / 功能概述

The KD1918S is a compact SMD photoelectric ball tilt switch designed for 360° omnidirectional tip-over detection. It provides a digital output signal that changes state when the device tilt angle exceeds a preset threshold. Multiple tilt detection angles such as 30°, 45°, 60°, and 75° are available and can be customized upon customer request. In addition to horizontal tilt detection, it also supports vertical flip detection for enhanced safety control.

KD1918S 是一款用于 360° 全方位倾倒检测的贴片式光电滚珠倾斜开关。当倾斜角度超过预设阈值时，输出端会切换电平信号。产品可提供 30°、45°、60°、75° 等多种倾斜检测角度，并可根据客户需求定制。同时具备垂直翻转检测能力，可实现更高安全等级的防倾倒保护。

Its sealed internal photoelectric mechanism ensures stable response, long service life, and excellent environmental resistance. The digital output can directly interface with MCU GPIO to support a wide range of motion-triggered applications.

内部光电结构采用全密封设计，响应稳定、寿命长，具备优异的环境适应性。数字信号输出可直接与 MCU GPIO 接口连接，适用于多种运动触发类应用。

Features / 产品特性

- Supports 360° omni-directional tilt detection
支持 360° 全方位倾倒检测
 - Outputs high level when upright; outputs low level when tilted beyond 30° ±10° in any direction
产品直立时输出高电平；向任意方向倾斜超过 30°±10° 时输出低电平
 - Digital output can directly trigger MCU GPIO or other control circuits
数字输出，可直接触发 MCU GPIO 或其他控制电路
 - Compact SMD package saves PCB space, ideal for miniaturized designs
贴片式小型封装，节省 PCB 空间，适用于紧凑型设计
 - High-temperature and RoHS-compliant materials, core-shell structure + vacuum manufacturing ensures long life and high reliability
采用耐高温、符合 RoHS 的环保材料，结合核壳结构与抽真空制造工艺，寿命长、可靠性高
 - Fully sealed structure, waterproof and dustproof; 100% factory tested
全密封结构防水、防尘，出厂前 100% 测试
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Applications / 应用领域

This tilt ball photoelectric switch is designed for reliable tip-over and motion sensing, especially for devices with limited internal space and high reliability requirements.
该倾斜滚珠光电开关适用于倾倒、运动方向、姿态变化检测，特别适用于空间受限和高可靠性要求的设备。

Typical applications include:

典型应用包括：

- Tilt safety protection circuits (e.g., tip-over power cut-off)
倾倒安全保护电路（如防倾倒断电装置）
- Smart home appliances (fans, heaters, air purifiers, etc.)
智能家用电器（风扇、取暖器、空气净化器等）
- Portable and wearable electronic devices
便携式与可穿戴电子设备
- Consumer electronics and motion-triggered devices
消费电子及运动触发类设备
- Industrial control and device attitude monitoring

工业控制与设备姿态监测

- Motion detection for service/educational robots
服务/教育机器人动作检测
 - Toys and interactive smart products
玩具与智能互动设备
-

Electrical Characteristics / 电气特性

Supply Voltage (Vcc) 供电电压	4.5-5.5V
Operating Current (Icc) 工作电流	6-10mA
Output Type (High/Low level definition) 输出类型 (TTL/CMOS, 高电平/低电平范围)	Continuous 连续导通
Response Time 响应时间	5ms – 100ms

Functional Characteristics / 功能特性

1. Operating Principle / 工作原理

The KD1918S tilt sensor operates based on a photoelectric ball mechanism.

When the device is upright, the conductive ball aligns with the internal optical path, allowing the phototransistor to conduct and generating a high-level output.

When the sensor tilts beyond the defined trigger angle, the ball shifts away from the optical path, blocking the light and causing the output to switch to low level.

KD1918S 倾斜传感器采用光电滚珠结构工作。

当产品保持垂直时，内部金属滚珠使光路保持通畅，光敏三极管导通，从而输出高电平。

当产品倾斜超过规定的触发角度时，滚珠离开光路位置，光线被遮断，输出信号切换为低电平。

2. Trigger Angle Characteristics / 触发角度特性

The sensor features a defined output behavior based on tilt angle:
传感器的倾斜触发角行为如下:

0° to $\pm 20^\circ$ → Stable high-level output

0° 至 $\pm 20^\circ$ → 输出稳定高电平

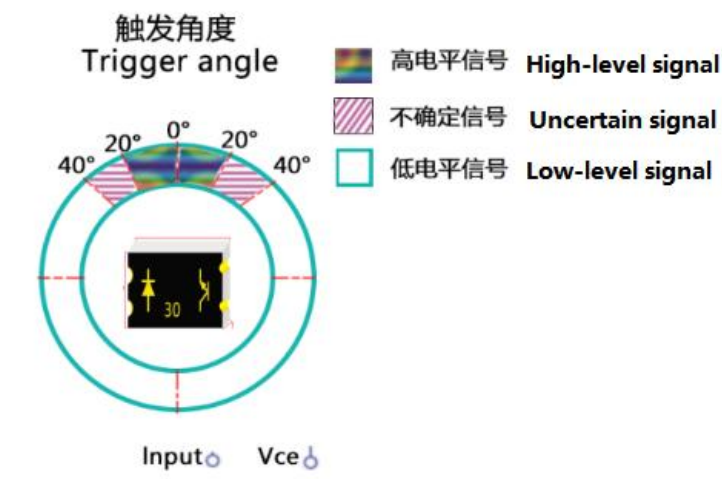
$\pm 20^\circ$ to $\pm 40^\circ$ → Transition (uncertain) zone

$\pm 20^\circ$ 至 $\pm 40^\circ$ → 输出位于过渡区（可能跳变）

Beyond $\pm 40^\circ$ → Stable low-level output

超过 $\pm 40^\circ$ → 输出稳定低电平

A visual representation of the trigger angle is shown in the diagram below.
触发角度分布请参见下图。



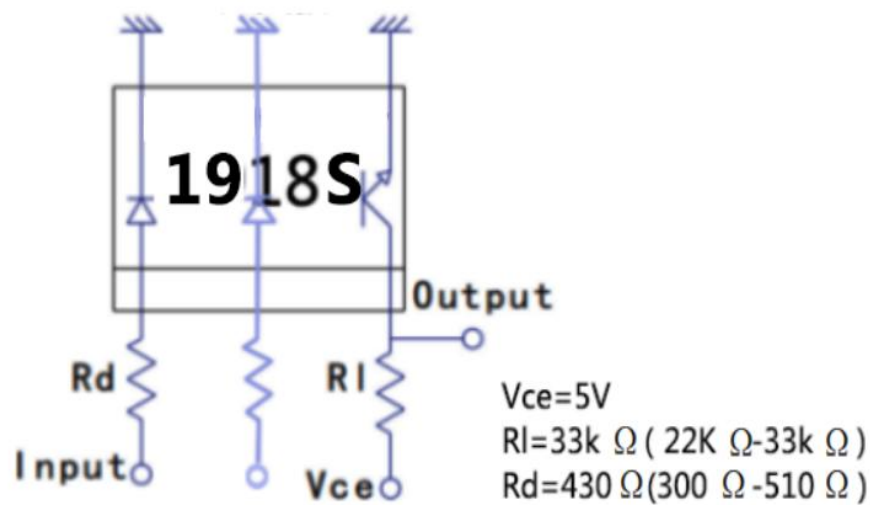
3. Internal Circuit Structure / 内部电路结构

The internal structure includes a photoelectric detection module, protective diodes, and two internal resistors (R_d and R_I). The output stage is an open-collector style, allowing direct connection to MCU GPIO.

内部结构包含光电检测模块、保护二极管及内部限流电阻（ R_d 和 R_I ）。输出采用开集电极结构，可直接与 MCU GPIO 电路连接。

Typical Internal Parameters / 典型内部参数

Parameter 参数	Typical 典型值	Range 范围
R_I (Pull-up Resistor) 上拉电阻	3k Ω	22k Ω –33k Ω
R_d (Input Resistor) 限流电阻	430 Ω	300 Ω –510 Ω
V_{ce} 集电极-发射极电压	5V	

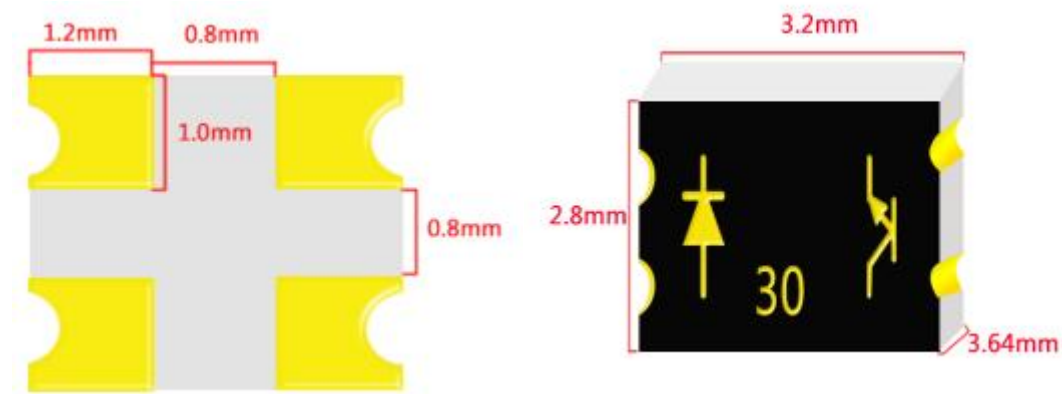


Mechanical Dimensions / 机械尺寸

Mechanical dimensions are shown as follows. All dimensions are in millimeters unless otherwise

specified.

产品机械尺寸如下，除特别说明外，单位均为毫米。



Back View

Front View

Reliability & Environmental Tests / 可靠性与环境测试

Operating Temperature 操作温度	-40°C to +85°C
Storage Temperature 储存温度	-10°C to +40°C
Salt Mist Test 盐雾测试	95%RH, 40°C, 72 hours
Operating Lifespan 操作寿命	1,000,000 times @ 2 Hz
Electrical Lifespan 电器寿命	1,000,000 times @ 2 Hz

Soldering Characteristics / 焊接特性

Manual Soldering

手工焊接

- Max tip temperature: **330°C ±10°C**

烙铁温度 **330°C ±10°C**

- Max contact time: **< 3 seconds**

接触时间 **< 3 秒**

Reflow Soldering (SMT)

回流焊 (SMT)

- Peak temperature: **255°C ±10°C**

峰值温度 **255°C ±10°C**

- Max exposure time: **< 5 seconds**

加热时间 **< 5 秒**

Flux Requirements

助熔剂要求

- Do not use strong acid or alkaline flux

助焊剂不得使用强酸性或强碱性材料

General Caution

注意

- Avoid mechanical stress during and after soldering

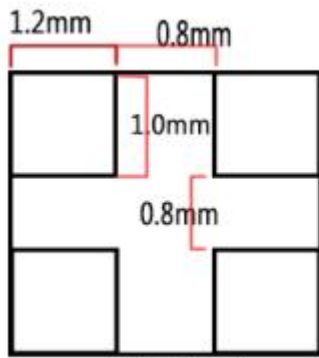
焊接过程中及焊后需避免机械应力

- Do not reflow more than twice

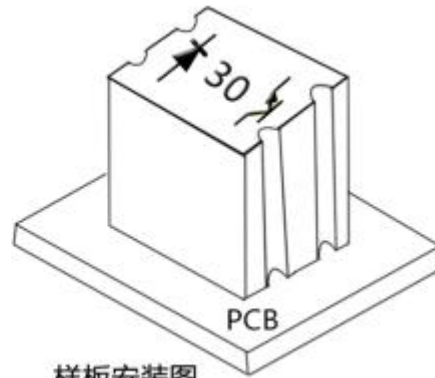
不建议回流焊超过两次

- Allow full cooling before handling

冷却前请勿搬动或外力按压器件



PCB焊盘贴片位



样板安装图

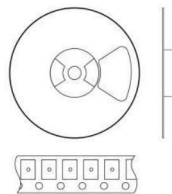
Packaging/包装

Tape&Reel packing

编带包装

4000pcs/Packing

4000pcs/盘



Notes & Safety Instructions/注意事项

1. Perform application-specific verification before use.

Before using this product, perform necessary tests and verification under actual application conditions to ensure proper functionality and reliability.

在使用本产品之前，应根据实际应用环境和条件进行必要的功能与可靠性测试，确认产品能够满足要求。

2. Use this product according to its intended purpose and specifications.

Refer to the datasheet for product characteristics, performance limits, and recommended operating conditions.

请依据产品特性、性能限制及规格书中规定的适用条件进行使用。

3.This product is not intended for life-support, safety-critical, or high-reliability systems.

Do not use the product in medical life-support equipment, safety protection systems, or devices requiring extremely high reliability.

本产品不得用于医疗生命维持设备、安全关键系统或其他需极高可靠性的装置。

4. Avoid contact with corrosive or conductive substances.

Keep the product away from acids, alkalis, corrosive chemicals, moisture, and conductive liquids to prevent damage.

Also avoid placing the product near strong magnetic or ferromagnetic materials.

请避免产品接触酸性、碱性、腐蚀性化学品及导电液体（如水、湿气），以防损坏。同时避免将产品置于强磁场或铁磁性物体附近。