



## SENSOR SWITCH

|        |                |             |             |               |       |
|--------|----------------|-------------|-------------|---------------|-------|
| Item # | RBS3109 Series | Description | TILT SWITCH | Version       | V99.0 |
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### ● FUNCTIONS

1. Tilt Detecting within a 360° radius
2. Slight Vibration Detecting

### ● APPLICATIONS

1. LCD monitor rotation
2. Home appliance tilt-off function
3. Earthquake alarm
4. Automotive devices
5. Visual devices
6. Information devices
7. Communication devices



### ● FEATURES

1. Housing made of high insulation plastic material, free from electric conduction and rust problem.
2. Detecting with photo transistors, generating highly reliable and stable signals.
3. All plastic materials subject to industrial purpose, resist high temperature and meet fireproof function.
4. Simple ON and OFF signals, easy for design.
5. Suitable to vertical PCB.
6. Tilt Angles: 15°, 20°, 30°, and 45° within a 360° radius.
7. RoHS compliance, an ideal substitute for mercury switch.
8. A more economical tilt and vibration detection option than IC design solution.
9. All made in Taiwan and examined before shipment.

### ● PATENTS

1. TAIWAN Patent NO. 181431
2. CHINA Patent NO. ZL 01 2 60920.X
3. U.S.A. Patent NO. US 6,800,841 B1



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● DIMENSIONS / OPERATION / P.C.B. LAYOUT (Unit: mm, Tolerance: ±0.25mm)

|                              |  |                                     |
|------------------------------|--|-------------------------------------|
| <p>RBS 31 09 10</p>          | <p>Tilt Angle 45°±10°</p>                          | <p>P.C.B. Layout (SMT)/Top View</p> |
| <p>Installation Position</p> | <p>Application Circuit</p>                         |                                     |
|                              | <p>1. Vce=5V<br/>2. RD=430ohm<br/>3. RL=33Kohm</p> |                                     |



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|                              |  |                                     |
|------------------------------|--|-------------------------------------|
| <p>RBS 31 09 11</p>          | <p>Tilt Angle <math>30^{\circ} \pm 10^{\circ}</math></p> | <p>P.C.B. Layout (SMT)/Top View</p> |
| <p>Installation Position</p> | <p>Application Circuit</p>                               |                                     |
|                              | <p>1. Vce=5V<br/>2. RD=430ohm<br/>3. RL=33Kohm</p>       |                                     |



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|                              |   |                                     |
|------------------------------|---|-------------------------------------|
| <p>RBS 31 09 12</p>          | <p>Tilt Angle <math>20^{\circ} \pm 10^{\circ}</math></p> <p> <span style="display:inline-block; width:10px; height:10px; background-color:black;"></span> Uncertain (<math>10^{\circ} \sim 30^{\circ}</math>)<br/>             (<math>-10^{\circ} \sim -30^{\circ}</math>)<br/> <span style="display:inline-block; width:10px; height:10px; border:1px dashed black;"></span> Lo district (<math>0^{\circ} \sim 10^{\circ}</math>)<br/>             (<math>0^{\circ} \sim 10^{\circ}</math>)<br/> <span style="display:inline-block; width:10px; height:10px; border:1px solid black;"></span> Hi district (<math>30^{\circ} \sim 180^{\circ}</math>)<br/>             (<math>-30^{\circ} \sim 180^{\circ}</math>)         </p> | <p>P.C.B. Layout (SMT)/Top View</p> |
| <p>Installation Position</p> | <p>Application Circuit</p>  |                                     |
|                              | <p>             1. <math>V_{ce} = 5V</math><br/>             2. <math>R_D = 430\text{ohm}</math><br/>             3. <math>R_L = 33K\text{ohm}</math> </p>  |                                     |



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|  |  |                                     |
|--|--|-------------------------------------|
| <p>RBS 31 09 13</p> <p>Anode Emitter<br/>Cathode Collector</p> | <p>Tilt Angle <math>15^\circ \pm 10^\circ</math></p> <p>Uncertain (<math>5^\circ \sim 25^\circ</math>) (<math>-5^\circ \sim -25^\circ</math>)<br/>Lo district (<math>0^\circ \sim 5^\circ</math>) (<math>0^\circ \sim -5^\circ</math>)<br/>Hi district (<math>25^\circ \sim 180^\circ</math>) (<math>-25^\circ \sim -180^\circ</math>)</p> | <p>P.C.B. Layout (SMT)/Top View</p> |
| <p>Installation Position</p>                                   | <p>Application Circuit</p>   |                                     |
| <p>P.C.B.</p>  | <p>1. <math>V_{ce}=5V</math><br/>2. <math>R_D=430\text{ohm}</math><br/>3. <math>R_L=33K\text{ohm}</math></p>   |                                     |

### ● Device Selection Guide

| Input Current (mA) | Operating Voltage (V) |
|--------------------|-----------------------|
| 10                 | 5                     |



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### ● Absolute Maximum Rating (Ta=25°C)

| Item                       |                             | Symbol           | Rating   | Unit |
|----------------------------|-----------------------------|------------------|----------|------|
| Input                      | Power Dissipation           | Pd               | 75       | mW   |
|                            | Reverse Voltage             | Vr               | 5        | V    |
|                            | Forward Current             | I <sub>F</sub>   | 50       | mA   |
|                            | Peak Forward Current (*1)   | I <sub>FP</sub>  | 1        | A    |
| Output                     | Collector Power Dissipation | Pc               | 100      | mW   |
|                            | Collector Current           | Ic               | 20       | mA   |
|                            | C-E Voltage                 | V <sub>CEO</sub> | 30       | V    |
|                            | E-C Voltage                 | V <sub>ECO</sub> | 5        | V    |
| Operating Temperature      |                             | Topr             | -25~+85  | °C   |
| Storage Temperature        |                             | Tstg             | -40~+100 | °C   |
| Soldering Temperature (*2) |                             | Tsol             | 260      | °C   |

(\*1) tw=100 uSec. 、T=10 mSec.

(\*2) t=5 Sec

### ● MECHANICAL CHARACTERISTICS

|    |                                    |  |
|----|------------------------------------|--|
| 1. | Temperature Range                  | Operating: -25°C to +85°C<br>Storage: -40°C to +85°C |
| 2. | Pull Force of Terminal             | 500 gf for 1 minute                                  |
| 3. | Operation Life                     | 30,000 hrs.  |
| 4. | Humidity                           | 95% RH, 40°C for 96 hrs.                             |
| 5. | Solder Ability                     | After flux 260±5°C for 5±0.5 seconds 95% coverage    |
| 6. | Reflow Soldering Heat for SMT Type | Reflow zone 260±5°C for 20 seconds max.              |



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### ● Electrical Optical Characteristics (Ta=25°C)

| Parameter              | Symbol        | Condition                   | Min. | Typ. | Max. | Unit      |
|------------------------|---------------|-----------------------------|------|------|------|-----------|
| Forward Voltage        | $V_F$         | $I_F=20mA$                  | —    | —    | 1.5  | V         |
| Reverse Current        | $I_R$         | $V_R=5V$                    | —    | —    | 10   | $\mu A$   |
| Peak Wavelength        | $\lambda_p$   | $I_F=10mA$                  |      | 940  |      | nm        |
| Dark Current           | $I_D$         | $V_{CE}=10V$                | —    | —    | 2    | $\mu A$   |
| C-E Saturation Voltage | $V_{CE(sat)}$ | $I_C=0.25mA$<br>$I_F=20mA$  | —    | —    | 0.4  | V         |
| Light Current          | $I_L$         | $V_{CE}=5V$<br>$I_F=20mA$   | 0.5  | 5    | —    | mA        |
| Rise Time              | $T_r$         | $I_C=0.8mA$<br>$V_{CC}=30V$ | —    | 5    | —    | $\mu sec$ |
| Fall Time              | $T_f$         | $R_L=1K\Omega$              | —    | 5    | —    | $\mu sec$ |

### ● BILL OF MATERIAL

|    |                           |                             |
|----|---------------------------|-----------------------------|
| 1. | Housing                   | Polyamide + Glass-Fiber     |
| 2. | Base                      | Polyamide + Glass-Fiber     |
| 3. | Ball                      | Stainless Steel             |
| 4. | Infrared Emitting Diodes  |                             |
| 5. | Silicon Photo Transistors |                             |
| 6. | Inside Part               | Copper Alloy, Nickel Plated |



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● Typical Electrical / Optical Characteristics Curves (Ta=25°C)

Fig.1 Power Dissipation vs. Ambient Temperature



Fig.2 Forward Current vs. Forward Voltage

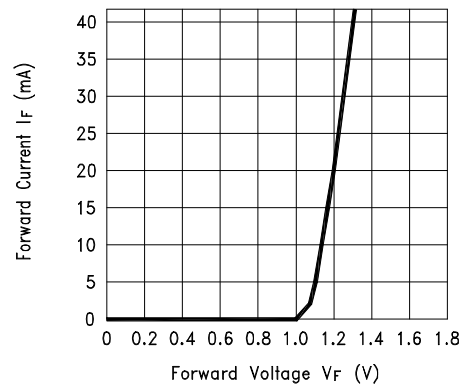


Fig.3 Collector Current vs. Collector-emitter Voltage

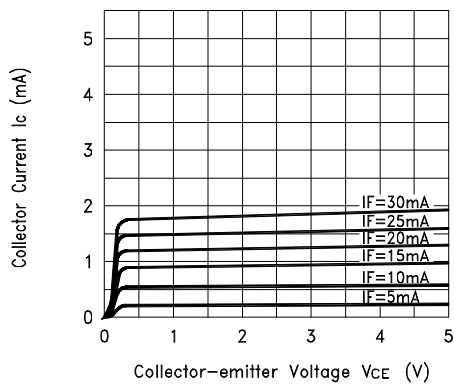
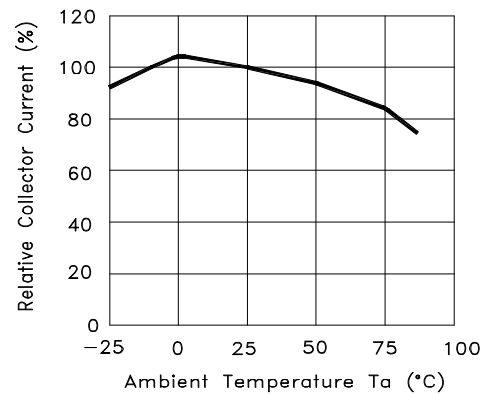


Fig.4 Collector Current vs. Ambient Temperature





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Fig.5 Collector-emitter Saturation Voltage vs. Ambient Temperature

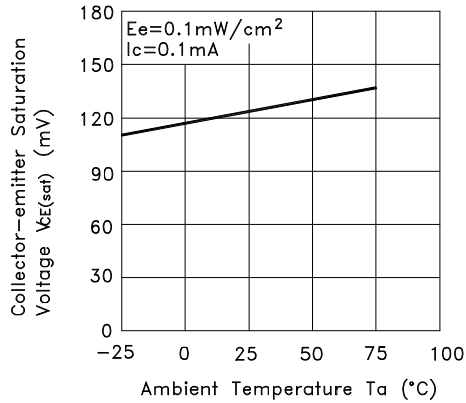


Fig.6 Response Time vs. Load Resistance

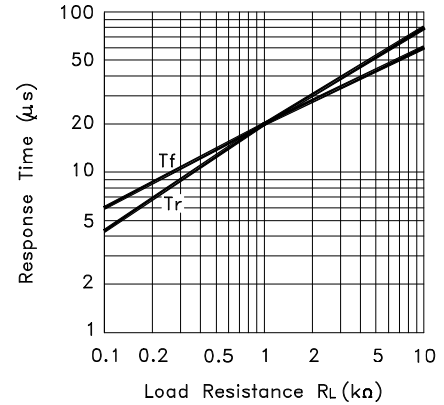
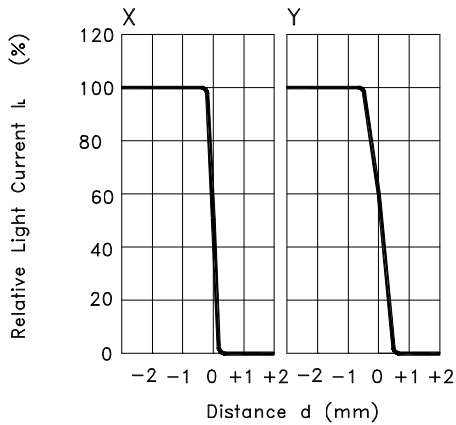
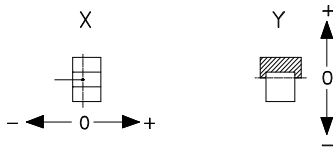


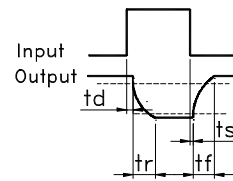
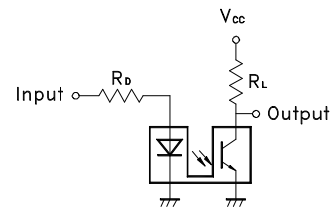
Fig.7 Sensing Position Characteristics (Typical)



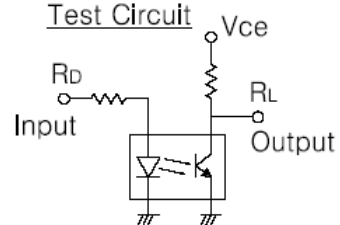
(Center of Optical axis)



Test Circuit for Response Time



Test Circuit





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### ● PACKAGE

|    | Part Number | Package   | Quantity | Total     | Size                            |
|----|-------------|-----------|----------|-----------|---------------------------------|
| 1. | RBS310910T  | Reel      | 350 pcs  | 350 pcs   | Diameter=30;<br>Width= 2.9 (cm) |
|    | RBS310911T  | Inner Box | 2 Reels  | 700 pcs   | 36 x 34 x 7 (cm)                |
|    | RBS310912T  | Carton(1) | 4 Boxes  | 2,800 pcs | 37 x 36 x 31 (cm)               |
|    | RBS310913T  | Carton(2) | 10 Boxes | 7,000 pcs | 70 x 36 x 38 (cm)               |

\* Minimum Order Quantity: One Reel

### ● NOTE

For the continued product improvement as one of the company policy, specifications may change or update without notice. The latest information can be obtained through our sales offices. Normally, all products are supplied under our standard conditions.

### ● PRECAUTIONS FOR USE

1. If the products is intended to be used for other endurance equipments requiring higher safety and reliability such as life support system, space and aviations devices, disaster and safety system, it's necessary to make verification of conformity or contact us for the details before using.
2. Don't try to clean the switch with a solvent or similar substance after the soldering process.
3. The switch might be damaged if using the water-soluble flux.