

## Tilt Sensor Switch

|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 1 of 10   |             | Publish Date | Jun. 26, 2018 |    |

### ● FUNCTIONS

1. Tilt Angles: 45° within a 360° radius
2. Suitable to horizontal PCB
3. Vibration Detecting

### ● APPLICATIONS

1. Automatically shut off for home appliances
2. Automatically shut off for Sporting equipment
3. Alarm system
4. Anti-theft / Anti-tamper devices
5. Being motion detection
6. Wake up systems for power saving
7. Automatically shut off for motorbike
8. Earthquake Detecting



### ● FEATURES

1. Housing made of high insulation plastic material, free from electric conduction and rust problem.
2. Sensing by phototransistors, Generating highly reliable and stable signals, not affected by oxidation or wear of metal.
3. All plastic materials subject to industrial purpose. Resist high temperature.
4. Simple ON and OFF signals, easy for design.
5. RoHS compliance, an ideal substitute for mercury switch.
6. A more economical tilt and vibration detection option than IC design solution.
7. All made in Taiwan and examined before shipment.



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|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 2 of 10   |             | Publish Date | Jun. 26, 2018 |    |

### ● PATENTS

1. Taiwan Patent No. M 420033
2. Taiwan Patent No. M 450817
3. Taiwan Patent No. I 553684
4. Taiwan Patent No. I 451463
5. China Patent No. ZL 201120339658.7
6. China Patent No. ZL 201220539712.7
7. China Patent No. ZL 201210017866.4
8. China Patent No. ZL 201210402905.2
9. U.S.A. Patent No. US 8,927,919,B2
10. U.S.A. Patent No. US 9,154,129 B2

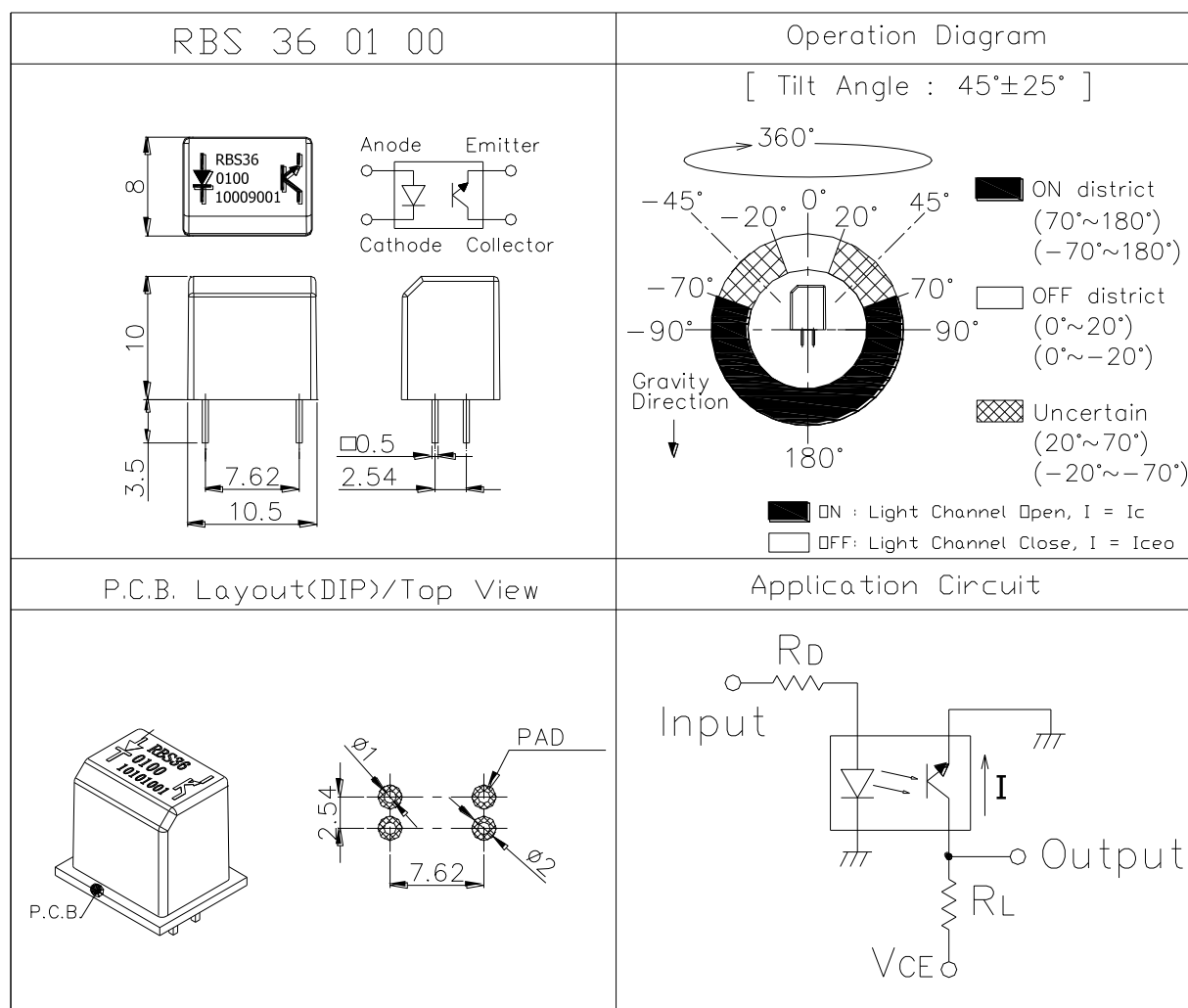


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|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 3 of 10   |             | Publish Date | Jun. 26, 2018 |    |

● DIMENSIONS / OPERATION / P.C.B. LAYOUT (Unit: mm, Tolerance:  $\pm 0.25\text{mm}$ )

Fig. 1



## Tilt Sensor Switch

|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 4 of 10   |             | Publish Date | Jun. 26, 2018 |    |

### ● Current/Voltage Suggested

| Input Current (mA) | Operating Voltage (V) | Condition                                                                   |
|--------------------|-----------------------|-----------------------------------------------------------------------------|
| 10                 | 3.3                   | V <sub>CE</sub> =3.3V<br>R <sub>D</sub> =200 ohm<br>R <sub>L</sub> =15K ohm |
| 10                 | 5                     | V <sub>CE</sub> =5V<br>R <sub>D</sub> =390 ohm<br>R <sub>L</sub> = 22K ohm  |

\* Please refer to above Application Circuit for designing electrical circuit.

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

| Item                       |                             | Symbol           | Rating    | Unit |
|----------------------------|-----------------------------|------------------|-----------|------|
| Input                      | Power Dissipation           | P <sub>d</sub>   | 75        | mW   |
|                            | Reverse Voltage             | V <sub>R</sub>   | 5         | V    |
|                            | Forward Current             | I <sub>F</sub>   | 50        | mA   |
|                            | Peak Forward Current (*1)   | I <sub>FP</sub>  | 1         | A    |
| Output                     | Collector Power Dissipation | P <sub>C</sub>   | 100       | mW   |
|                            | Collector Current           | I <sub>C</sub>   | 20        | mA   |
|                            | C-E Voltage                 | V <sub>CEO</sub> | 30        | V    |
|                            | E-C Voltage                 | V <sub>ECO</sub> | 5         | V    |
| Operating Temperature      |                             | T <sub>opr</sub> | -25 ~ +85 | °C   |
| Storage Temperature        |                             | T <sub>stg</sub> | -40 ~ +85 | °C   |
| Soldering Temperature (*2) |                             | T <sub>sol</sub> | 260       | °C   |

(\*1) t<sub>w</sub>=100 μSec., T=10 mSec.

(\*2) t=5 Sec



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|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 5 of 10   |             | Publish Date | Jun. 26, 2018 |    |

● Electrical Optical Characteristics (Ta=25°C)

| Parameter              | Symbol               | Condition                                                          | Min. | Typ. | Max. | Unit            |
|------------------------|----------------------|--------------------------------------------------------------------|------|------|------|-----------------|
| Forward Voltage        | $V_F$                | $I_F=20\text{mA}$                                                  | -    | 1.2  | 1.5  | V               |
| Reverse Current        | $I_R$                | $V_R=5\text{V}$                                                    | -    | -    | 10   | $\mu\text{A}$   |
| Peak Wavelength        | $\lambda_p$          | $I_F=10\text{mA}$                                                  |      | 940  | -    | nm              |
| Dark Current           | $I_{ce0}$            | $V_{CE}=10\text{V}$                                                | -    | -    | 100  | $\mu\text{A}$   |
| C-E Saturation Voltage | $V_{CE}(\text{sat})$ | $I_C=0.25\text{mA}$<br>$I_F=20\text{mA}$                           | -    | -    | 0.4  | V               |
| Light Current          | $I_C$                | $V_{CE}=5\text{V}$<br>$I_F=20\text{mA}$                            | 0.5  | 5    | -    | mA              |
| Rise Time              | $T_r$                | $I_C=0.8\text{mA}$<br>$V_{CC}=30\text{V}$<br>$R_L=1\text{K}\Omega$ | -    | 5    | -    | $\mu\text{sec}$ |
| Fall Time              | $T_f$                |                                                                    | -    | 5    | -    | $\mu\text{sec}$ |
| Operation Diagram      | $\theta$             | Fig. 1                                                             | 20   | 45   | 70   | °               |



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|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 6 of 10   |             | Publish Date | Jun. 26, 2018 |    |

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

Fig.1 Power Dissipation vs. Ambient Temperature

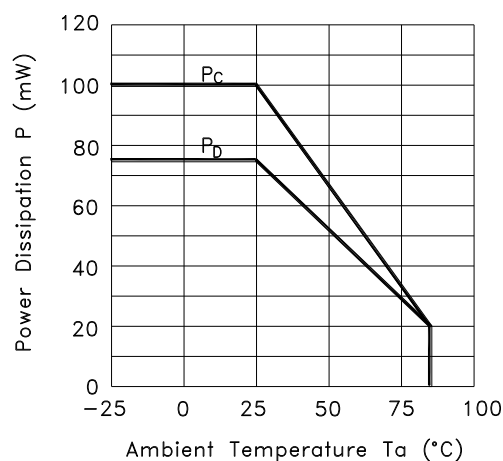


Fig.2 Forward Current vs. Forward Voltage

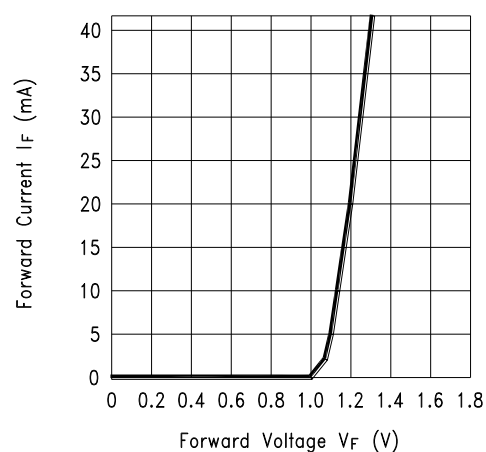


Fig.3 Collector Current vs. Collector-emitter Voltage

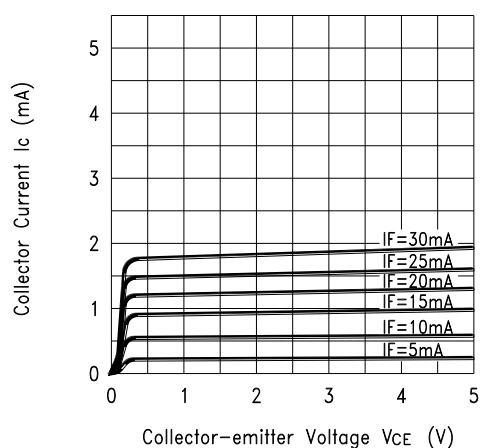
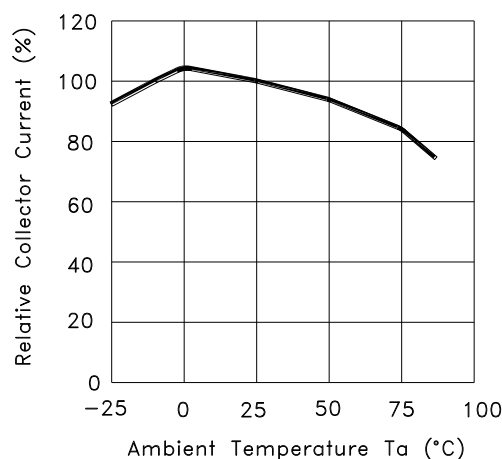


Fig.4 Collector Current vs. Ambient Temperature



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|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 7 of 10   |             | Publish Date | Jun. 26, 2018 |    |

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

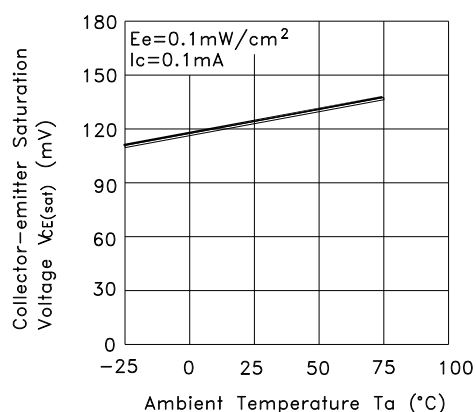


Fig.6 Response Time vs. Load Resistance

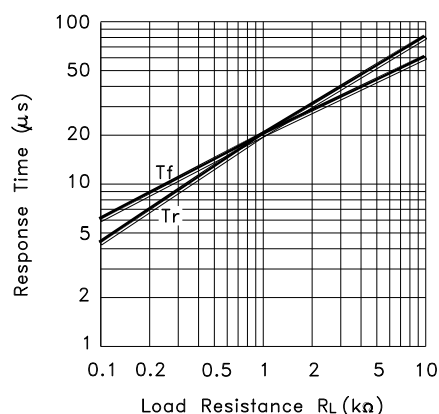
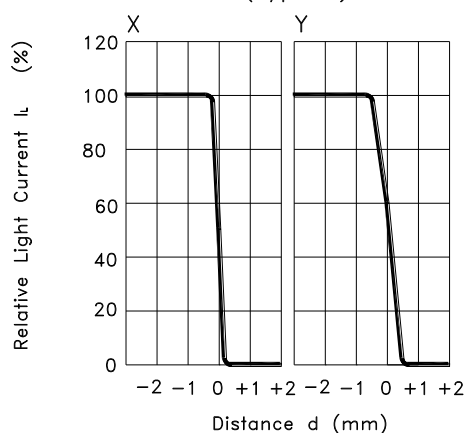
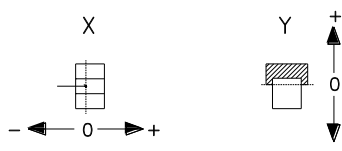


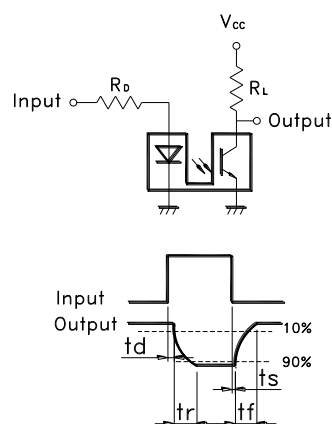
Fig.7 Sensing Position Characteristics (Typical)



(Center of Optical axis)



Test Circuit for Response Time



## Tilt Sensor Switch

|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 8 of 10   |             | Publish Date | Jun. 26, 2018 |    |

### ● RELIABILITY TEST

Reliable Test for RBS3109 Series

|   | Test Item           | Contents                                                        |
|---|---------------------|-----------------------------------------------------------------|
| 2 | Operating Temp      | -25°C ~ 85°C                                                    |
| 3 | Storage Temp        | -40°C ~ 85°C                                                    |
| 4 | Humidity Test       | 40 °C / 95 %RH                                                  |
| 5 | Mechanical Test     | 2Hz, horizontal<br>1,000,000 times                              |
| 6 | Operation Life Test | I <sub>F</sub> =20 mA, V <sub>CE</sub> =5 V<br>TIME: 30,000 hrs |

### ● SOLDERING CONDITION

Following soldering conditions are for reference only, please use soldering information that solder paste manufacturer recommends.

| Condition<br>Suitable<br>Production<br>Process | Soldering<br>Temperature | Soldering Time   | Wattage of<br>Manual Soldering                           | Type |
|------------------------------------------------|--------------------------|------------------|----------------------------------------------------------|------|
| Wave Soldering                                 | 260±5°C                  | < 5 seconds max. | -                                                        | DIP  |
| Manual Soldering                               | 300±5°C                  | < 3 seconds max. | 20W or<br>Temperature-<br>controlled manual<br>soldering | DIP  |



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|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 9 of 10   |             | Publish Date | Jun. 26, 2018 |    |

### ● PACKAGE

|    | Part Number | Package   | Quantity | Total      | Dimension (mm) |
|----|-------------|-----------|----------|------------|----------------|
| 1. | RBS360100   | IC Tube   | 48 pcs   | 48 pcs     | 525L*10W*17.5H |
|    |             | Inner box | 84 Tubes | 4,032 pcs  | 539L*130W*130H |
|    |             | Carton    | 4 Boxes  | 16,128 pcs | 551L*285W*288H |

※ Package is shown as below for reference !



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|          |           |             |              |               |    |
|----------|-----------|-------------|--------------|---------------|----|
| Item No. | RBS360100 | Description | Ball-Contact | Version       | 15 |
| Page     | 10 of 10  |             | Publish Date | Jun. 26, 2018 |    |

### ● NOTE

1. Suggestion for usage: For vibration usage or application, we suggest to add hysteresis for IC.
2. 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 equipment requiring higher safety and reliability such as life support system, space and aviation devices, disaster and safety system, it's necessary to make verification of conformity or contact us for the details before using.
2. Do not try to clean the switch with a solvent or similar substance after the soldering process.
3. Use water-soluble flux may damage the switch.
4. Please follow the soldering instruction accordingly, otherwise might lead to defective.
5. Do not use switch in the environment of high humidity, because such an environment may cause the leakage current between the terminals.
6. Please do not exceed the rated load as there will be a risk of disabling the product function.
7. In the circuit, switch should not be near or directly connected with the magnetic component solder joints (for example: relays, transformers, etc.).
8. To prevent damaging IR and PT, please make ESD protection, for example: wearing a conductive wrist strap or antistatic gloves during production process, or grounding machinery etc.

