

Tilt Sensor Switch

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● **FUNCTIONS**

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

● **APPLICATIONS**

1. Rotation detection for LCD monitor
2. Automatically shut off for home appliances
3. Automatically shut off for Sporting equipment
4. Automatically shut off for motorbike
5. Alarm system
6. Anti-theft / Anti-tamper devices
7. Being motion detection (personal locator)
8. Wake up systems for power saving, such like remote controllers
9. Earthquake Detecting



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● 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: 20° 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. I 310952
2. Taiwan Patent No. M 450817
3. USA Patent No. US 6,800,841 B1
4. USA Patent No. US 7,402,791 B2
5. China Patent No. ZL 200610083013.5
6. China Patent No. ZL 200820126206.9
7. China Patent No. ZL 201220539712.7
8. Japan Patent No. 4384217
9. Japan Patent No. 3148127

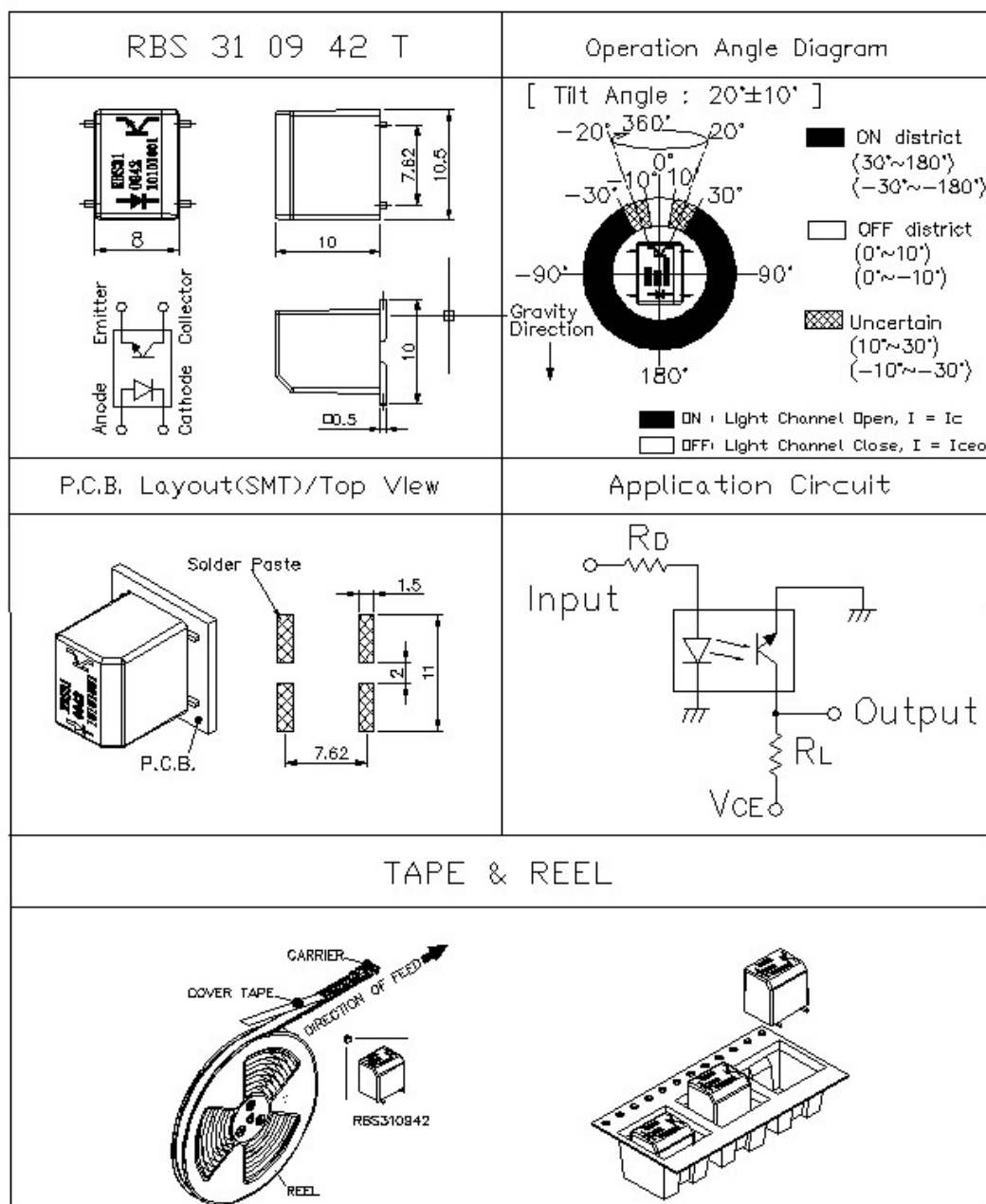


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● DIMENSIONS / OPERATION / P.C.B. LAYOUT (Unit: mm, Tolerance: ± 0.25 mm)

Fig. 1



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● Current/Voltage/Conditions Suggested

Input Current (mA)	Operating Voltage (V)	Conditions
10	3.3	$V_{CE}=3.3V$ $R_D=200\text{ ohm}$ $R_L=33K\text{ ohm}$
10	5	$V_{CE}=5V$ $R_D=390\text{ ohm}$ $R_L=33K\text{ ohm}$

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

● Absolute Maximum Rating ($T_a=25^{\circ}C$)

Item		Symbol	Rating	Unit
Input	Power Dissipation	P_d	75	mW
	Reverse Voltage	V_R	5	V
	Forward Current	I_F	50	mA
	Peak Forward Current (*1)	I_{FP}	1	A
Output	Collector Power Dissipation	P_C	100	mW
	Collector Current	I_C	20	mA
	C-E Voltage	V_{CEO}	30	V
	E-C Voltage	V_{ECO}	5	V
Operating Temperature		T_{opr}	$-40\sim+85$	$^{\circ}C$
Storage Temperature		T_{stg}	$-40\sim+85$	$^{\circ}C$
Soldering Temperature (*2)		T_{sol}	260	$^{\circ}C$

(*1) $t_w=100\text{ }\mu\text{Sec.}$ 、 $T=10\text{ mSec.}$

(*2) $t=5\text{ Sec}$



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● Electrical Optical Characteristics (Ta=25°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	$I_F=20mA$	-	1.2	1.5	V
Reverse Current	I_R	$V_R=5V$	-	-	10	μA
Peak Wavelength	λ_p	$I_F=10mA$		940		nm
Dark Current	I_{ceo}	$V_{CE}=10V$	-	-	2	μA
C-E Saturation Voltage	$V_{CE(sat)}$	$I_C=0.25mA$ $I_F=20mA$	-	-	0.4	V
Light Current	I_C	$V_{CE}=5V$ $I_F=20mA$	0.5	5	-	mA
Rise Time	T_r	$I_C=0.8mA$ $V_{CC}=30V$ $R_L=1K\Omega$	-	5	-	μsec
Fall Time	T_f		-	5	-	μsec



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

Fig.1 Power Dissipation vs. Ambient Temperature

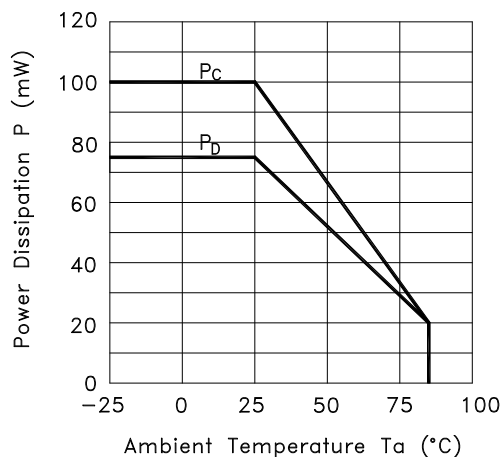


Fig.2 Forward Current vs. Forward Voltage

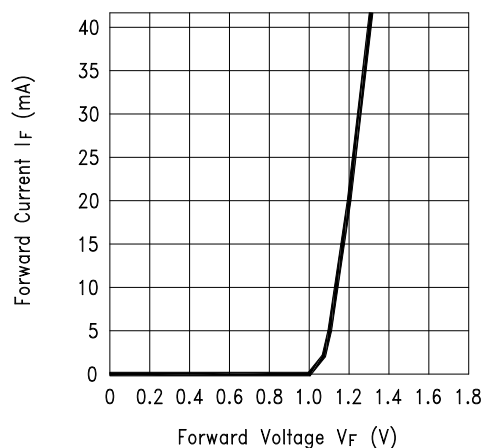


Fig.3 Collector Current vs. Collector-emitter Voltage

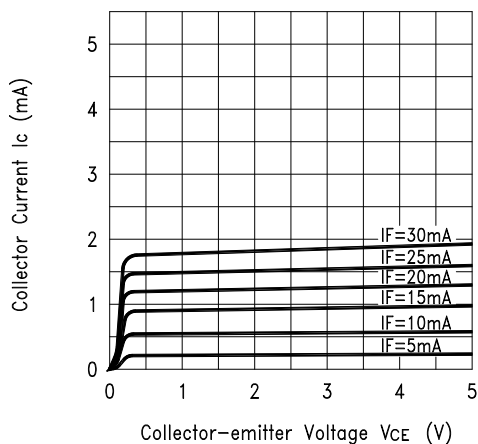
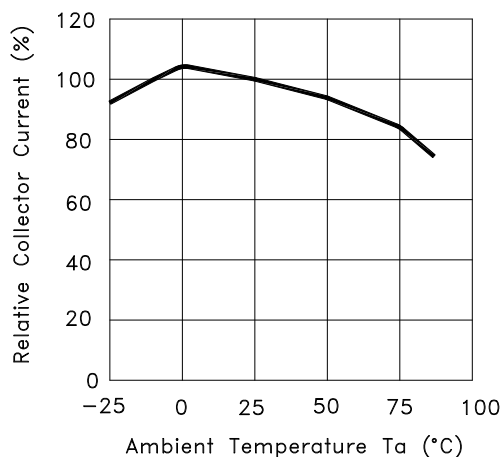


Fig.4 Collector Current vs. Ambient Temperature



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

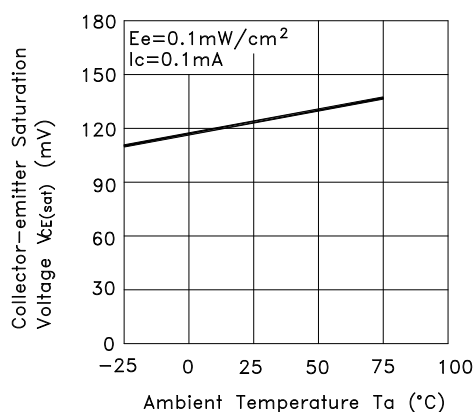


Fig.6 Response Time vs. Load Resistance

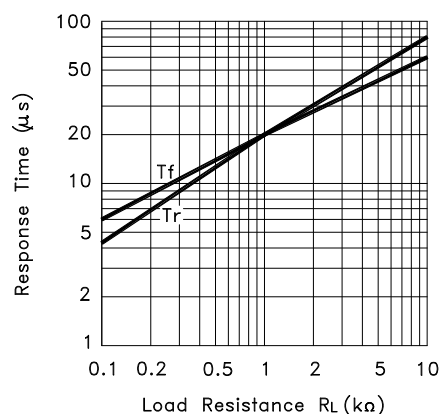
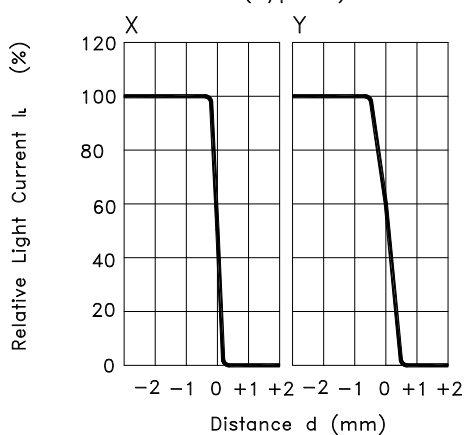
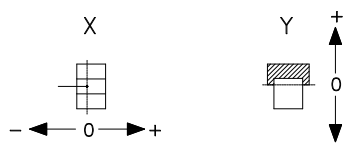


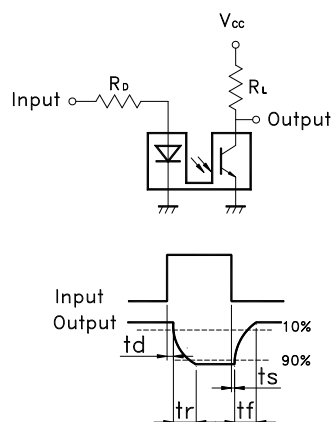
Fig.7 Sensing Position Characteristics (Typical)



(Center of Optical axis)



Test Circuit for Response Time



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● ELECTRICAL CHARACTERISTICS

1	Contact Rating	--
2	Contact Resistance	--
3	Angle Tolerance	Please refer to Fig. 1
4	Insulation Resistance	--
5	Dielectric Strength	--
6	Capacitance	--

● RELIABLE TEST ITEMS

Test Item	Standard	Test Content
IR Reflow	MIL-STD-202G, TEST METHOD 210F、 IPC/JEDEC J-STD-020D	Peak temp.=255~260°C *3times
Operation Temperature	MIL-STD-202G, TEST METHOD 107G, TEST A	-40°C ~ +85°C
Storage Temperature	MIL-STD-202G, TEST METHOD 107G, TEST A	-40°C ~ +85°C
Humidity	MIL-STD-202G, TEST METHOD 103B	40°C /95%RH
Mechanical Life	--	2Hz, horizontal 1,000,000 times
Electrical Life	MIL-STD-883E:1016	I _F =20 mA, V _{CE} =5 V TIME: 30,000 hrs



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● SOLDERING CONDITION

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

Condition Operation Method	Soldering Temperature	Soldering Time	Wattage of Manual Soldering	Suitable Production Process
IR Reflow	Please refer to following < Table of classification Reflow profile > and Table 2		---	SMT
Manual Soldering	300±5℃	< 3 seconds max.	30W or Temperature- controlled manual soldering	SMT



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< Table of classification Reflow profile >

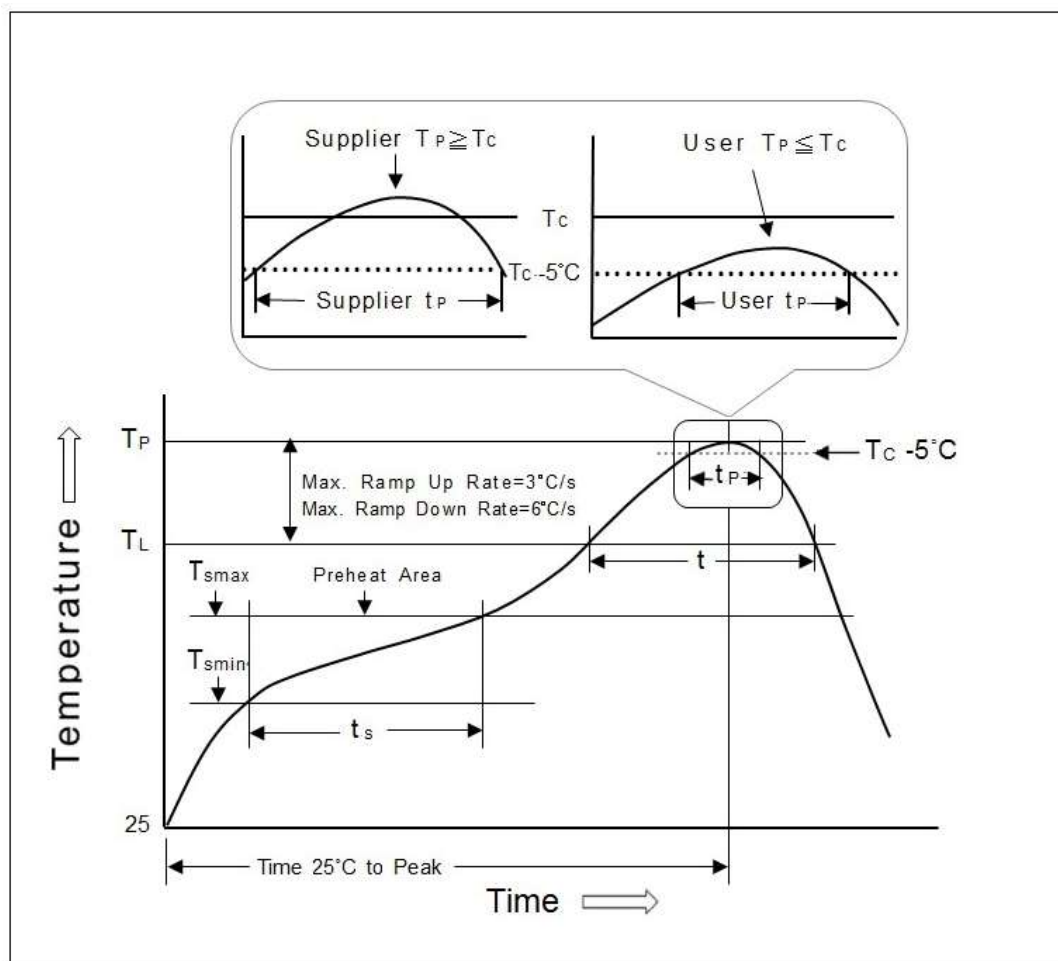
Item	Pb process	Pb free process
Pre-heat and Soak Temperature min.(T _{min}) Temperature max.(T _{max}) Time (T _{min} to T _{max})(ts)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ram-up Rate (T _{max} to T _p)	3 °C/second max.	3 °C/second max.
Liquidous Temperature (TL) Time at Liquidous (tL)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T _p)*	230 °C ~235 °C *	255 °C ~260 °C *
Classification temperature(T _c)	235 °C	260 °C
Time(tp)** within 5 °C of the specified classification temperature (T _c)	20** seconds	30** seconds
Average ram-down Rate (T _p to T _{max})	6 °C/second max.	6 °C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum.		



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Table 2



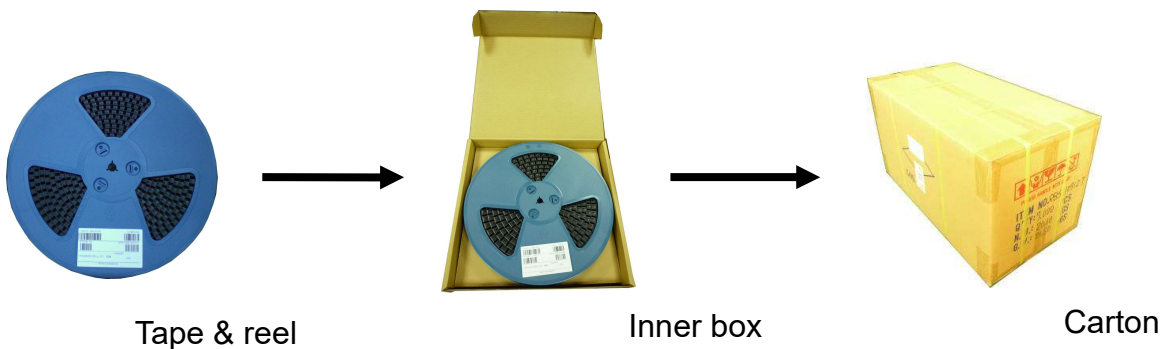
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● PACKAGE

	Part Number	Package	Quantity	Total	Dimension(mm)
1.	RBS310942T	Tape & Reel	350 pcs	350 pcs	φ330*25H
		Inner Box	2 Reels	700 pcs	355L*340W*68H
		Carton	10 Boxes	7,000 pcs	703L*364W*380H

※ Package shown as below for reference.



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● NOTES

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. When the soldering temperature exceeds specifications, the switch may fall apart.
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 electrostatic protective treatment, for example: wearing a conductive wrist strap or antistatic gloves during production process, and grounding machinery etc.

