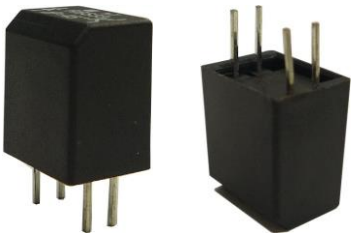
SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	1 of 17		Date	Sep. 16, 2013	

● FUNCTION



1. Tilt Detecting within a 360° radius
2. 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 (personal locator)
6. Wake up systems for power saving, such like remote controllers
7. Automatically shut off for motorbike tilt
8. Earthquake Detecting

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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	2 of 17		Date	Sep. 16, 2013	

● 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 for horizontal 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. I 310952
2. TAIWAN PATENT NO. M 450817
3. JAPAN PATENT NO. 4384217
4. JAPAN PATENT NO. 3148127
5. U.S.A. PATENT NO. US 6,800,841 B1
6. U.S.A. PATENT NO. US 7,402,791 B2
7. CHINA PATENT NO. ZL 200610083013.5
8. CHINA PATENT NO. ZL 200820126206.9
9. CHINA PATENT NO. ZL 201220539712.7

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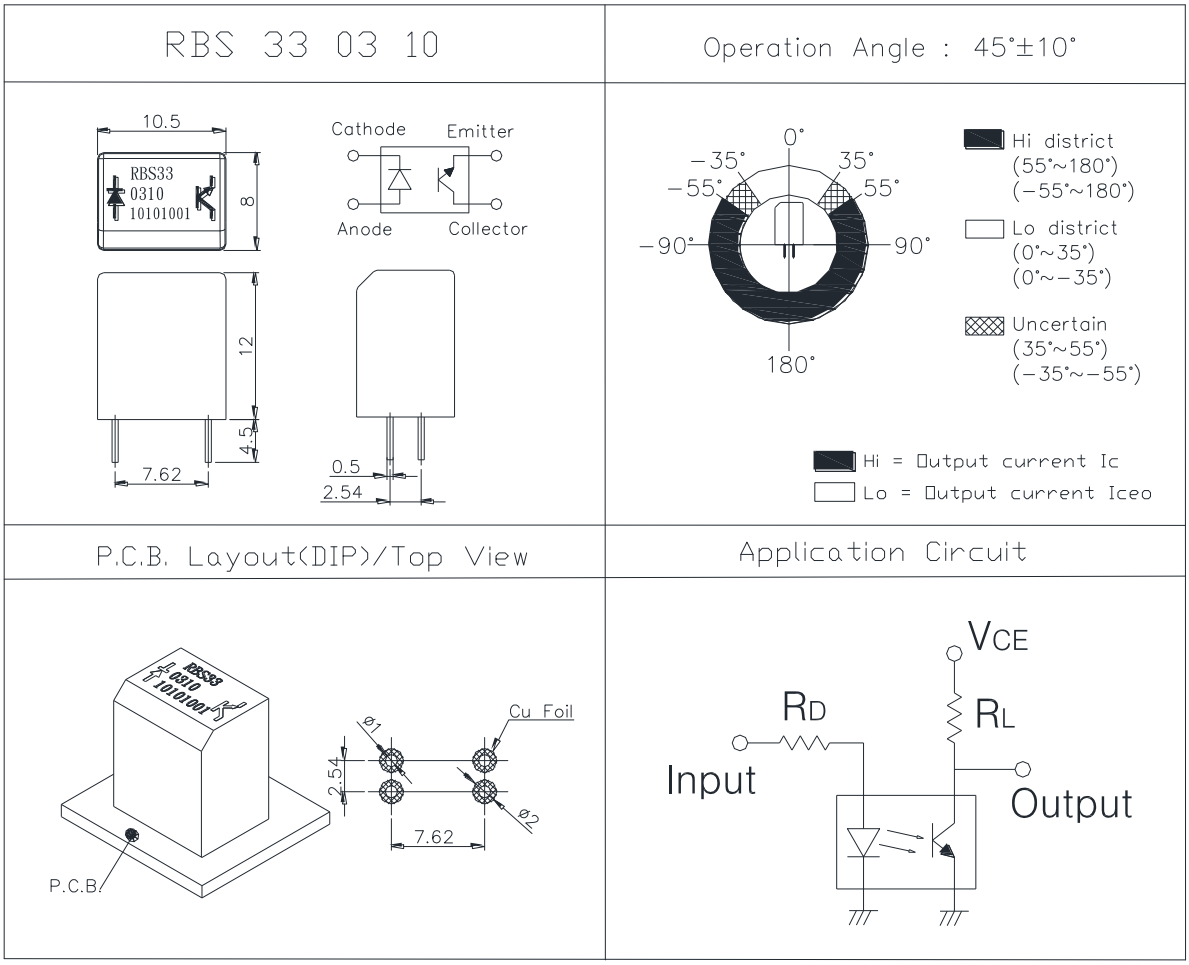
SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	3 of 17		Date	Sep. 16, 2013	

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

Fig. 1



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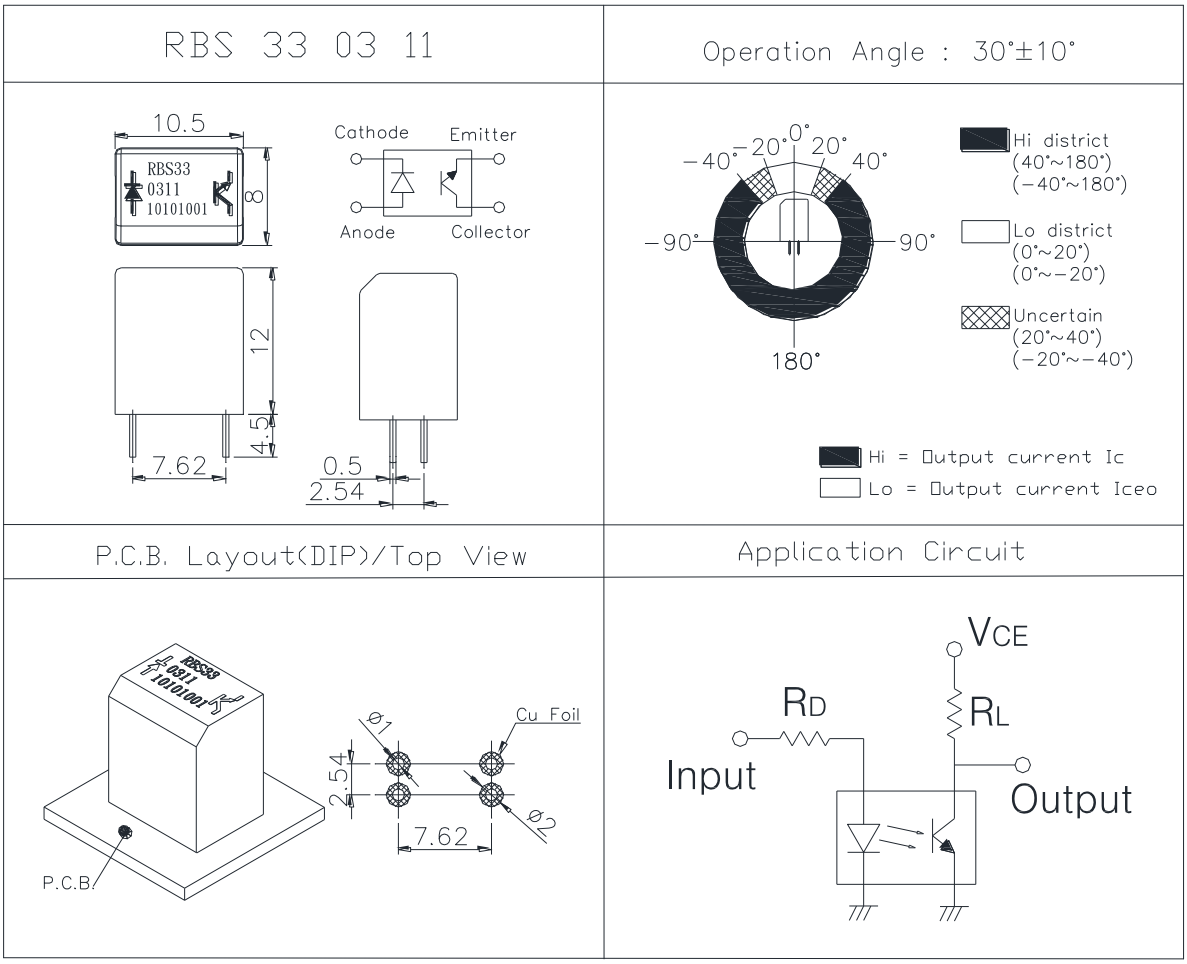
SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	4 of 17		Date	Sep. 16, 2013	

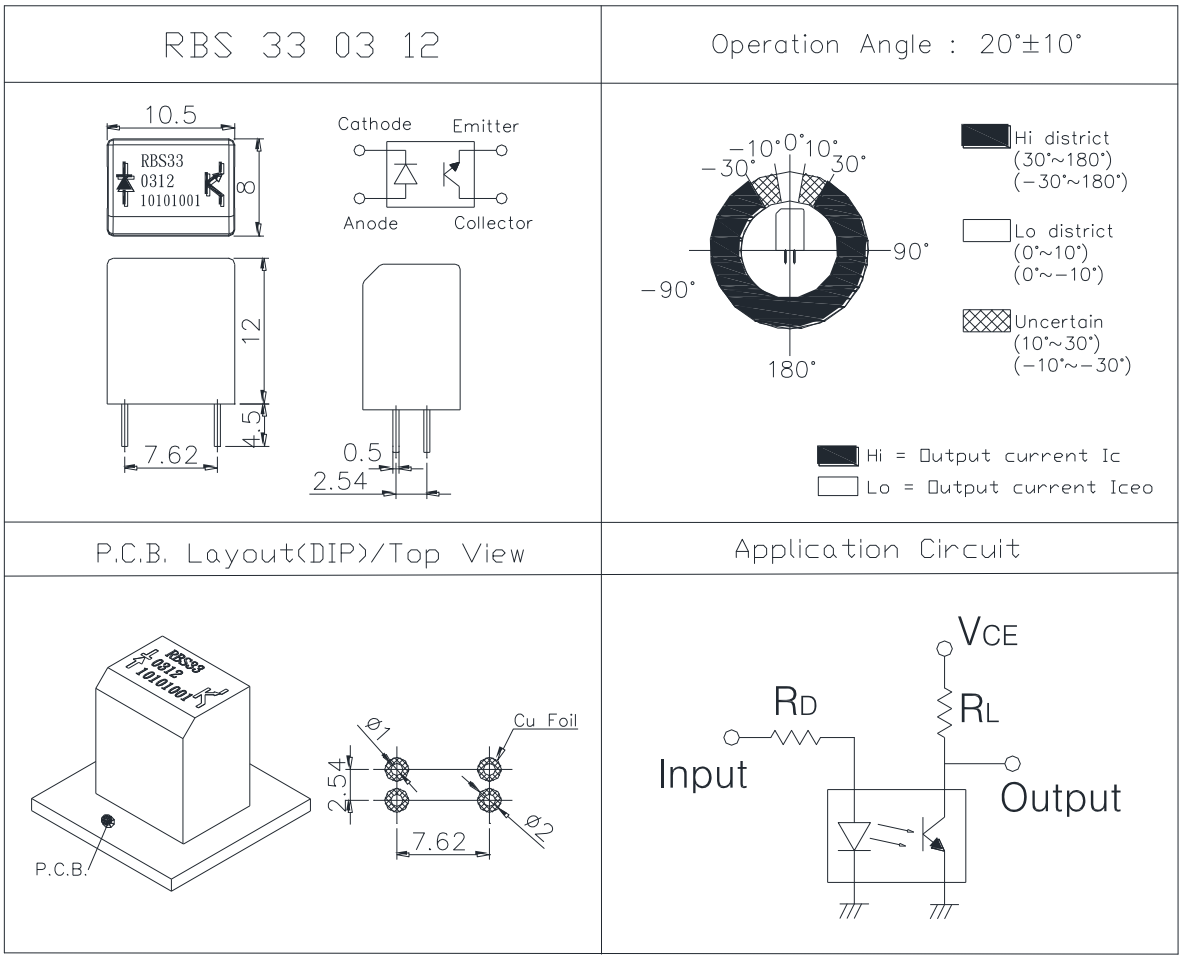
Fig. 2



SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	5 of 17		Date	Sep. 16, 2013	

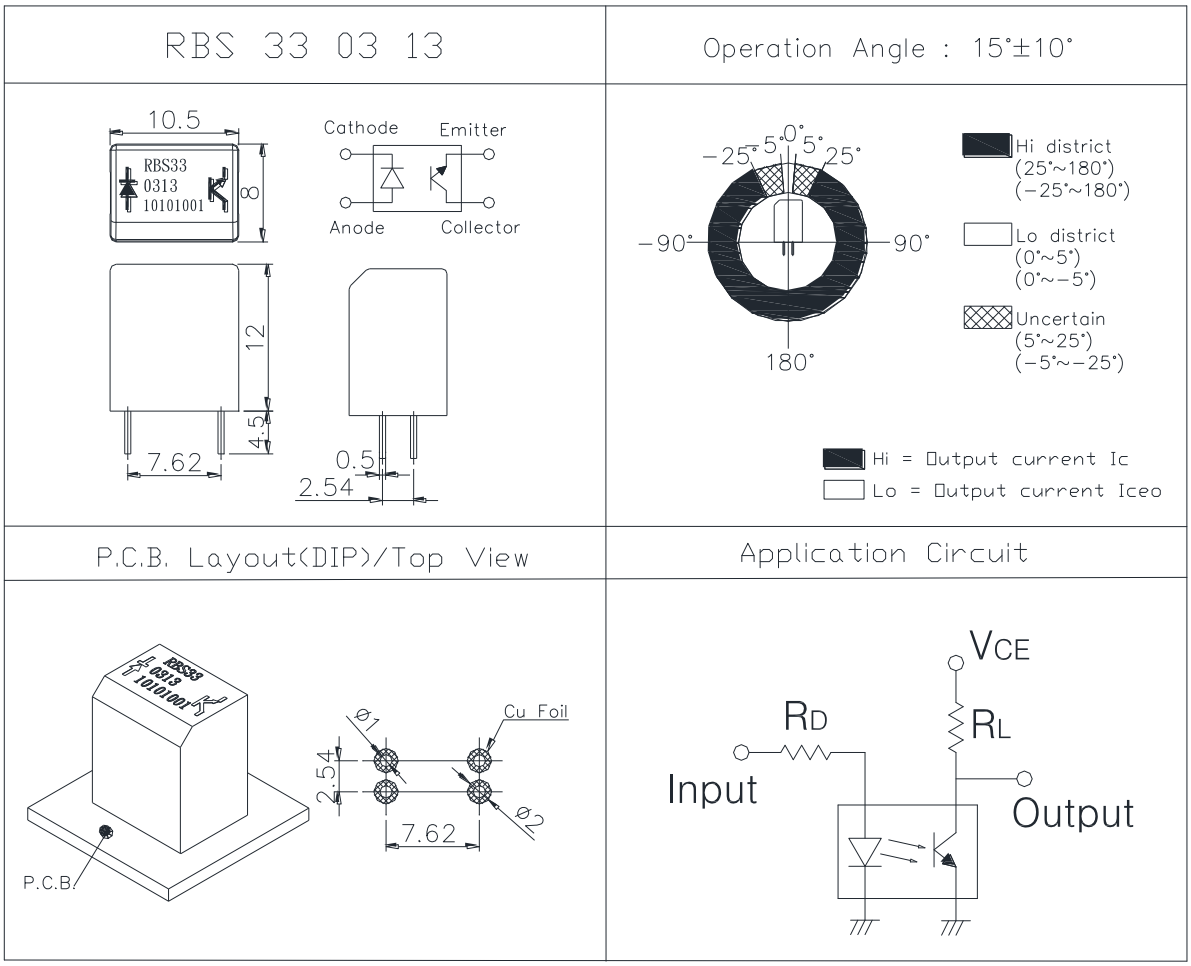
Fig. 3



SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	6 of 17		Date	Sep. 16, 2013	

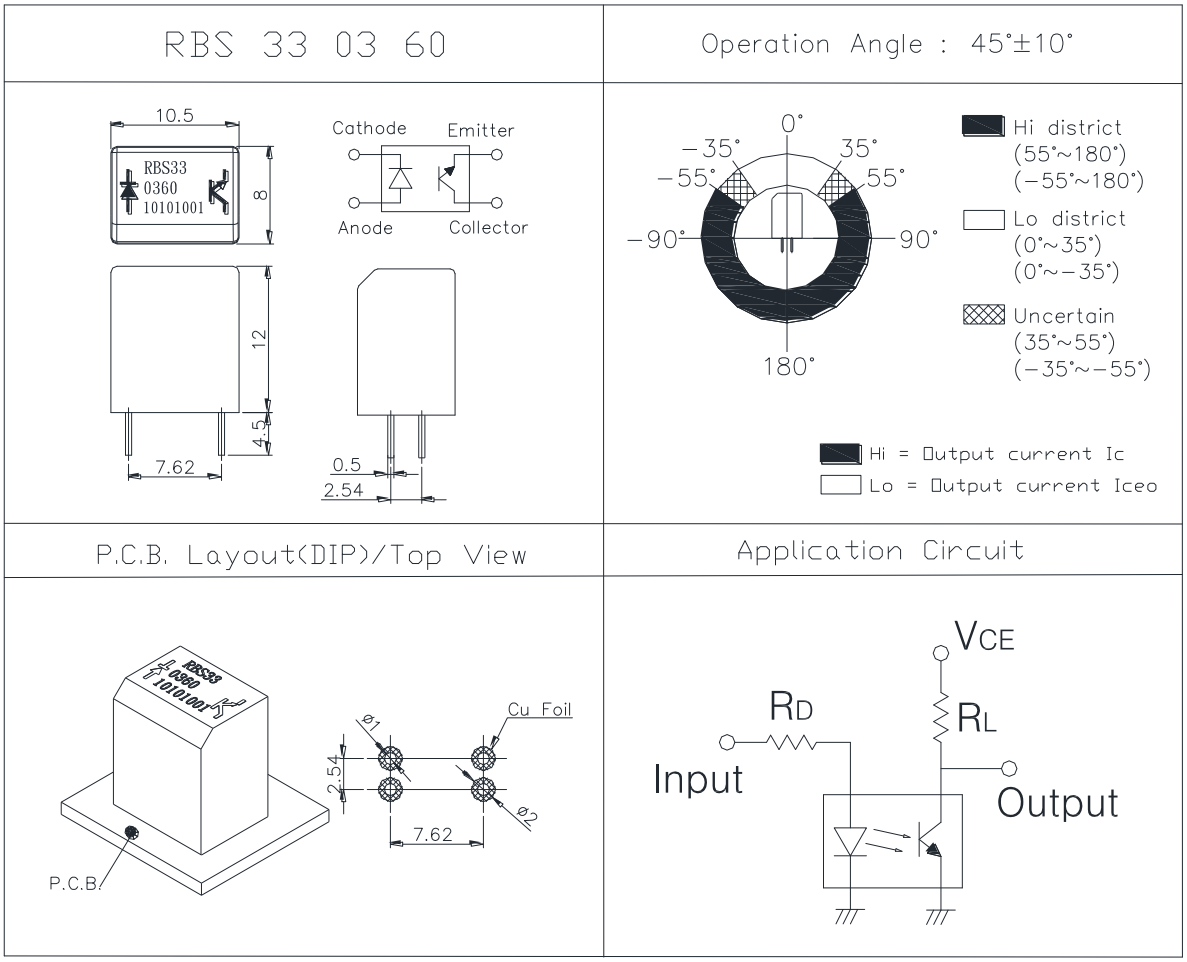
Fig. 4



SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	7 of 17		Date	Sep. 16, 2013	

Fig. 5



SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	8 of 17		Date	Sep. 16, 2013	

● Current/Voltage Suggested

Input Current (mA)	Operating Voltage (V)	Condition
10	5	V_{CE}=5V R_D=470 ohm R_L=33K ohm

● Absolute Maximum Rating （Ta=25℃）

Item		Symbol	Rating	Unit
Input	Power Dissipation	Pd	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		Topr	-25~+85	℃
Storage Temperature		Tstg	-40~+85	℃
Soldering Temperature (*2)		Tsol	260	℃

(*1) tw=100 uSec.、T=10 mSec.
(*2) t=5 Sec

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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	9 of 17		Date	Sep. 16, 2013	

● Electrical Optical Characteristics (Ta=25℃)

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	λp	I_F=10mA		940		nm
Dark Current	Iceo	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	Tr	I_C=0.8mA V_{CC}=30V R_L=1KΩ	-	5	-	μsec
Fall Time	Tf		-	5	-	μsec

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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	10 of 17		Date	Sep. 16, 2013	

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

Fig.1 Power Dissipation vs. Ambient Temperature

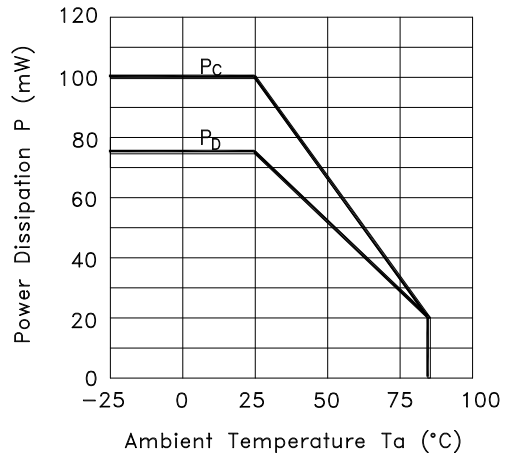


Fig.2 Forward Current vs. Forward Voltage

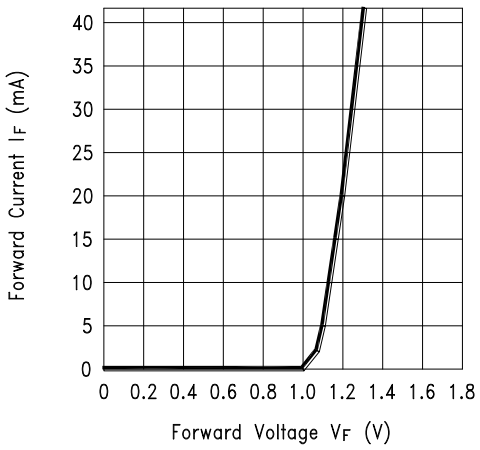


Fig.3 Collector Current vs. Collector−emitter Voltage

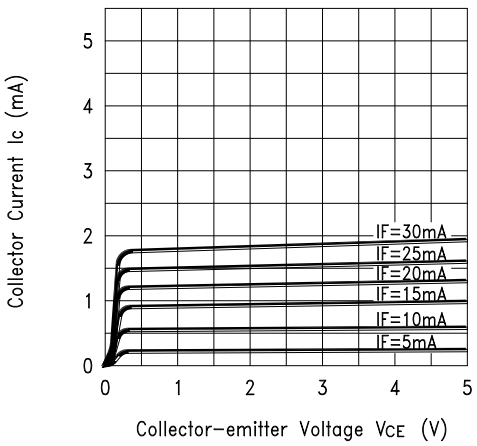
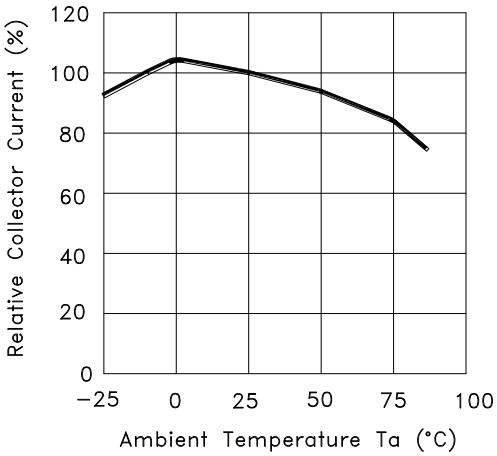


Fig.4 Collector Current vs. Ambient Temperature



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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	11 of 17		Date	Sep. 16, 2013	

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

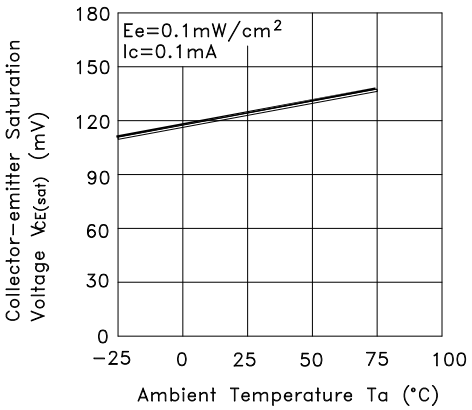


Fig.6 Response Time vs. Load Resistance

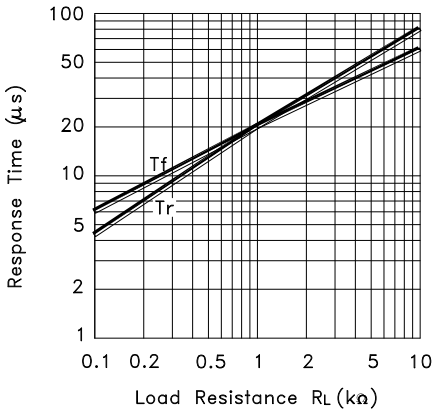
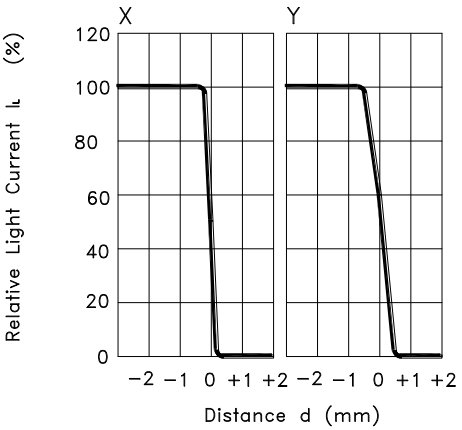
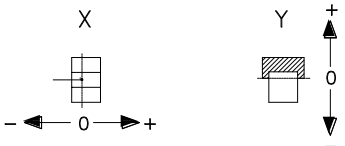


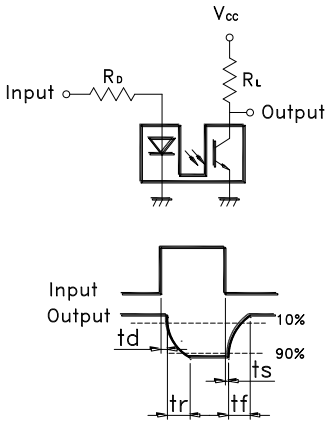
Fig.7 Sensing Position Characteristics (Typical)



(Center of Optical axis)



Test Circuit for Response Time



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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	12 of 17		Date	Sep. 16, 2013	

● ELECTRICAL CHARACTERISTICS

1.	Contact Rating	--
2.	Contact Resistance	--
3.	Differential Angle	Refer to Fig. 1~ Fig. 5
4.	Insulation Resistance	--
5.	Dielectric Strength	--
6.	Capacitance	--

● RELIABLE TEST ITEMS

Test Item	Standard	Contents
IR Reflow	--	--
Operating Temperature	MIL-STD-202G, TEST METHOD 107G, TEST A	-25°C~85°C
Storage Temperature	MIL-STD-202G, TEST METHOD 107G, TEST A	-40℃~85℃
Humidity	MIL-STD-202G, TEST METHOD 103B	40℃/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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Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	13 of 17		Date	Sep. 16, 2013	

● 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 Fig. 6		-	SMT
Wave Soldering	260±5℃	< 5 seconds max.	-	DIP
Manual Soldering	260±5℃	< 5 seconds max.	20W or Temperature-controlled manual soldering	DIP、SMT

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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	14 of 17		Date	Sep. 16, 2013	

< Table of classification Reflow profile >

Item	Pb process	Pb free process
Pre-heat and Soak Temperature min.(Tsmin) Temperature max.(Tsmax) Time (Tsmin to Tsmax)(ts)	 100 °C 150 °C 60-120 seconds	 150 °C 200 °C 60-120 seconds
Average ram-up Rate (Tsmax to Tp)	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 (Tp)*	230 °C ~235 °C *	255 °C ~260 °C *
Classification temperature(Tc)	235 °C	260 °C
Time(tp)** within 5 °C of the specified classification temperature (Tc)	20** seconds	30** seconds
Average ram-down Rate (Tp toTsmax)	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 (Tp) 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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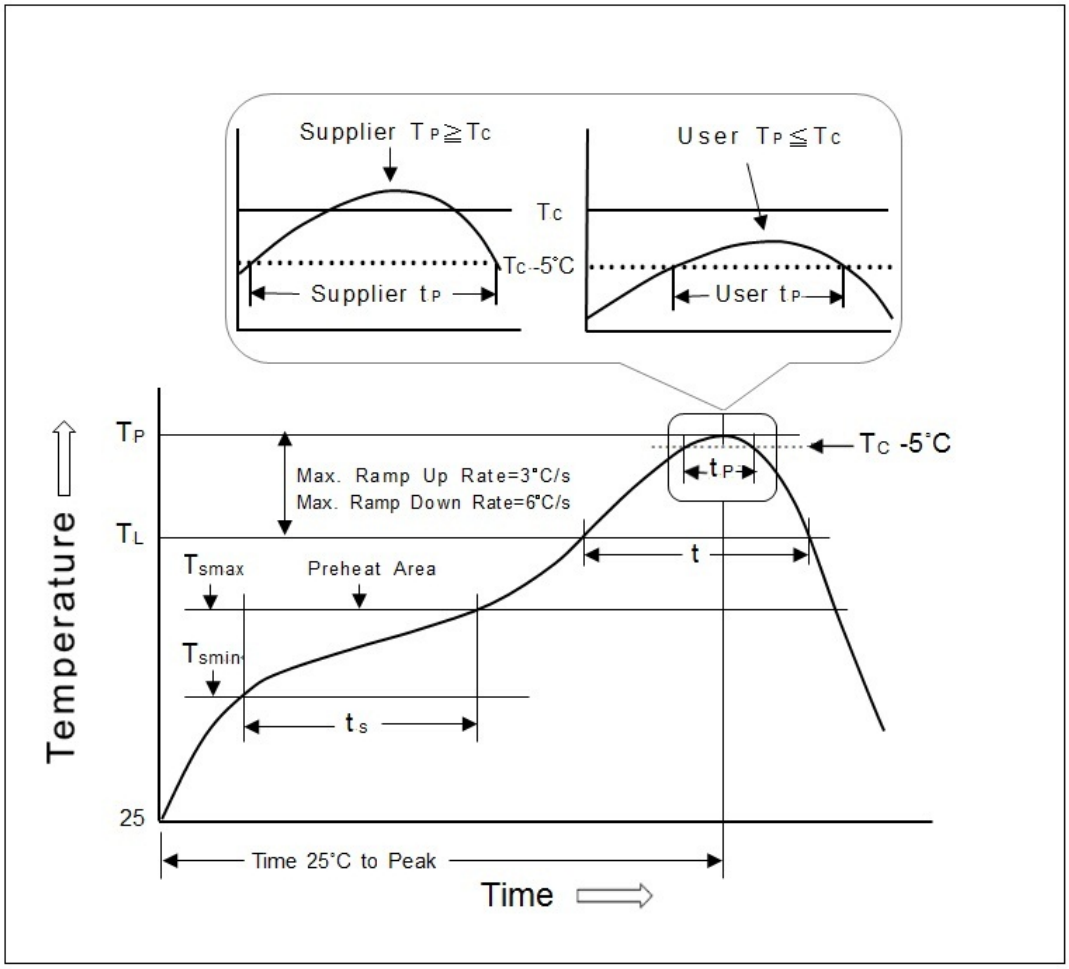
Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	15 of 17		Date	Sep. 16, 2013	

Fig. 6



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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	16 of 17		Date	Sep. 16, 2013	

● PACKAGE

	Part Number	Package	Quantity	Total	Dimension
1.	RBS330310 RBS330311 RBS330312 RBS330313 RBS330360	IC tube	48 pcs	48 pcs	525L*10W*17.5H
		Inner box	72 tubes	3,456 pcs	539L*130W*130H
		Carton	4 boxes	13,824 pcs	551L*285W*288H

※ Package shown as below for reference.

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SENSOR SWITCH

Item No.	RBS3303 Series	Description	ROLL BALL SWITCH	Version	9
Page	17 of 17		Date	Sep. 16, 2013	

● 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. More than the rated load may cause fire, so do not use more than the load
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、grounding machinery etc.

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