OncQue™

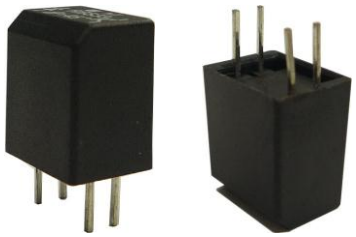
OncQue Corporation
大日科技股份有限公司

SENSOR SWITCH

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	1 of 15		Date	Sep. 28, 2012	

FUNCTION

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

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 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.

No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

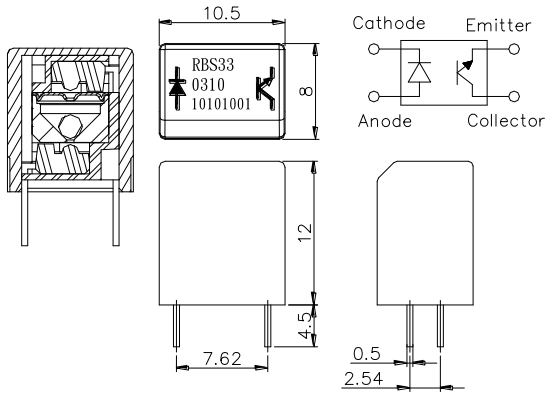
Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	2 of 15		Date	Sep. 28, 2012	

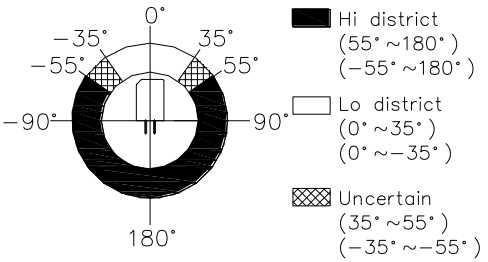
- PATENTS
  1. TAIWAN PATENT NO. I 310952
  2. U.S.A. PATENT NO. US 6,800,841 B1
  3. U.S.A. PATENT NO. US 7,402,791 B2
  4. CHINA PATENT NO. ZL 200610083013.5
  5. JAPAN PATENT NO. 4384217

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

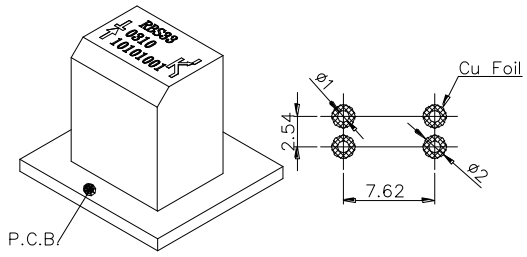
RBS 33 03 10



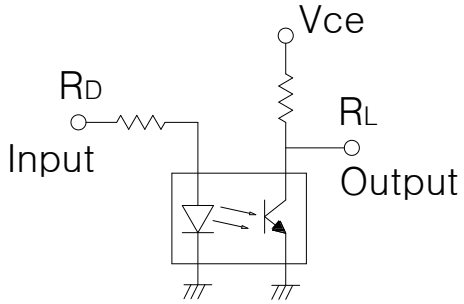
Operation Angle



P.C.B. Layout(DIP)/Top View



Application Circuit

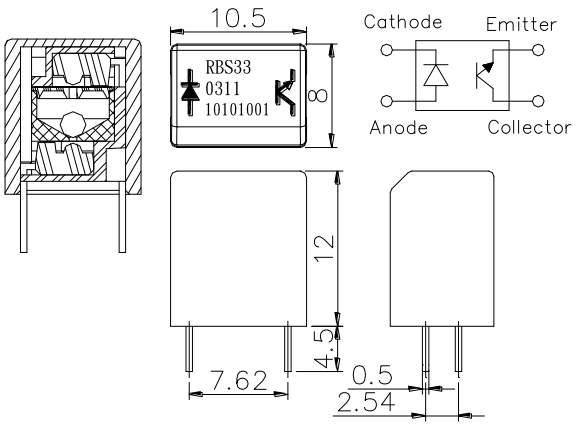


No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

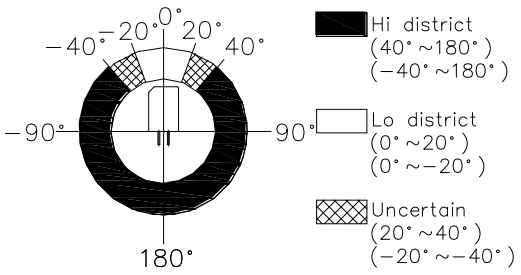
Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	3 of 15		Date	Sep. 28, 2012	

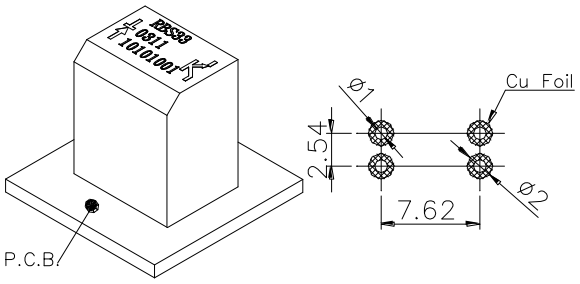
RBS 33 03 11



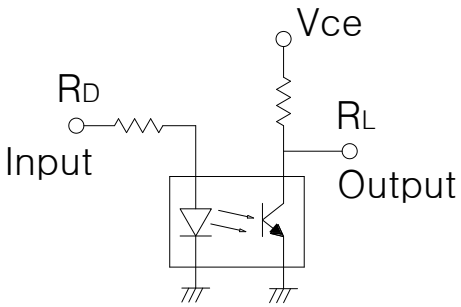
Operation Angle



P.C.B. Layout(DIP)/Top View



Application Circuit

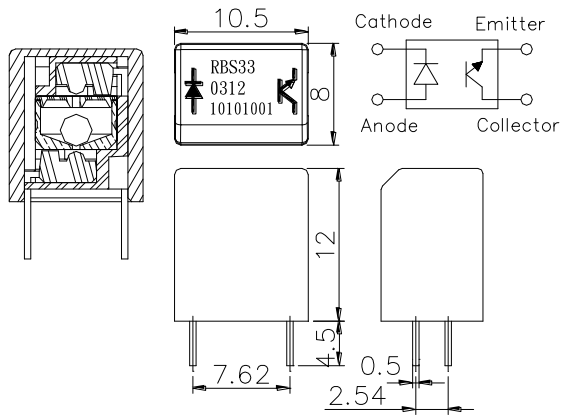


No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

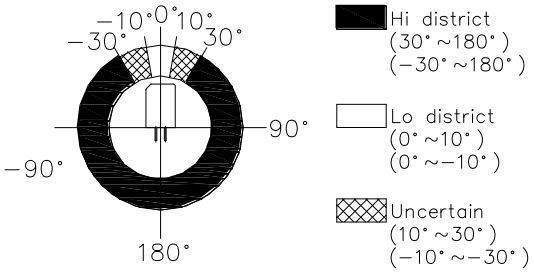
Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	4 of 15		Date	Sep. 28, 2012	

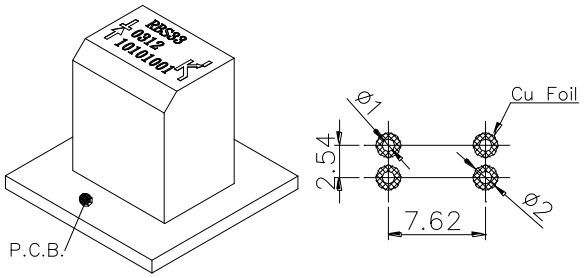
RBS 33 03 12



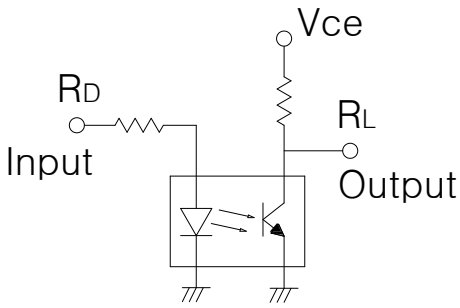
Operation Angle



P.C.B. Layout(DIP)/Top View



Application Circuit

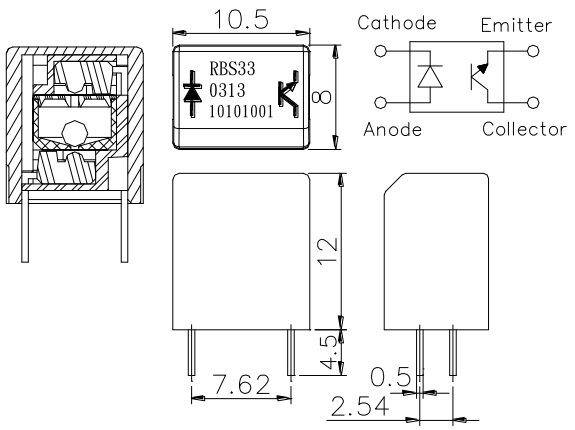


No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

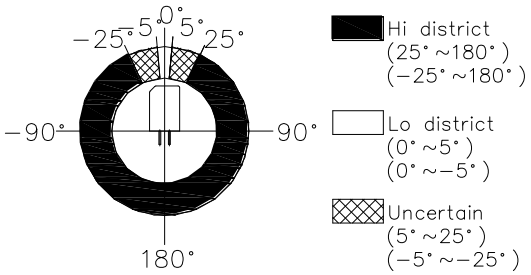
Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	5 of 15		Date	Sep. 28, 2012	

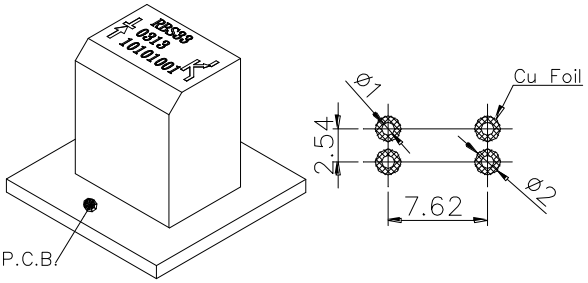
RBS 33 03 13



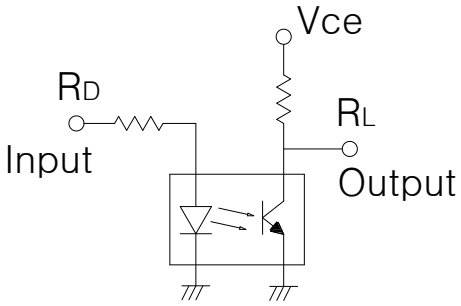
Operation Angle



P.C.B. Layout(DIP)/Top View



Application Circuit

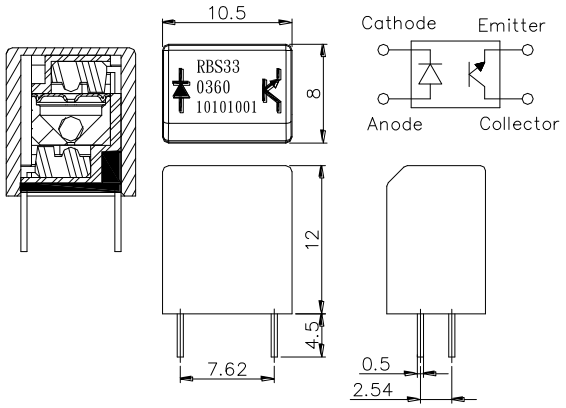


No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

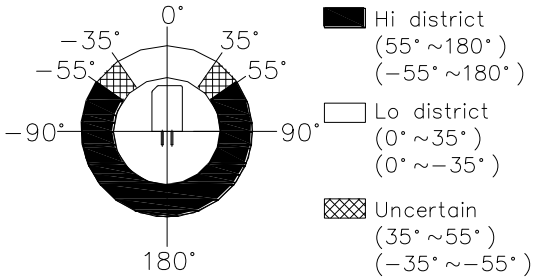
Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	6 of 15		Date	Sep. 28, 2012	

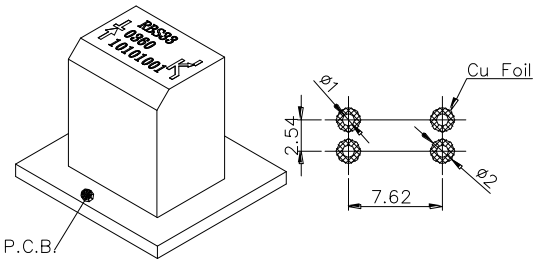
RBS 33 03 60



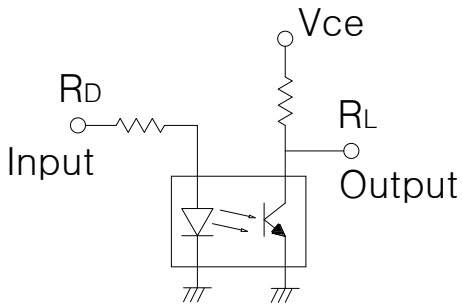
Operation Angle



P.C.B. Layout(DIP)/Top View



Application Circuit



● Current/Voltage Suggested

Input Current (mA)	Operating Voltage (V)	Condition
10	5	Vce=5V RD=470ohn RL=33Kohn

No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	7 of 15		Date	Sep. 28, 2012	

● Absolute Maximum Rating （Ta=25℃）

Item		Symbol	Rating	Unit
Input	Power Dissipation	Pd	75	mW
	Reverse Voltage	Vr	5	V
	Forward Current	IF	50	mA
	Peak Forward Current (*1)	IFP	1	A
Output	Collector Power Dissipation	Pc	100	mW
	Collector Current	Ic	20	mA
	C-E Voltage	VCEO	30	V
	E-C Voltage	VECO	5	V
Operating Temperature		Topr	-25~+85	℃
Storage Temperature		Tstg	-40~+100	℃
Soldering Temperature (*2)		Tsol	260	℃

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

No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	8 of 15		Date	Sep. 28, 2012	

● Electrical Optical Characteristics (Ta=25℃)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=20mA	-	-	1.5	V
Reverse Current	IR	VR=5V	-	-	10	μA
Peak Wavelength	λp	IF=10mA		940		nm
Dark Current	ID	VCE=10V	-	-	2	μA
C-E Saturation Voltage	VCE (sat)	IC=0.25mA IF=20mA	-	-	0.4	V
Light Current	IL	VCE=5V IF=20mA	0.5	5	-	mA
Rise Time	Tr	IC=0.8mA Vcc=30v RL=1KΩ	-	5	-	μsec
Fall Time	Tf		-	5	-	μsec

No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	9 of 15		Date	Sep. 28, 2012	

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

Fig.1 Power Dissipation vs. Ambient Temperature

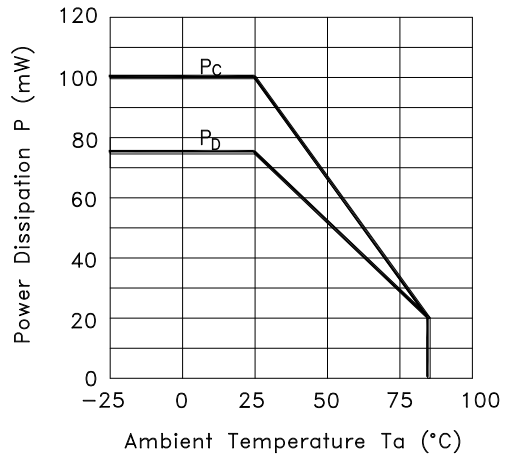


Fig.2 Forward Current vs. Forward Voltage

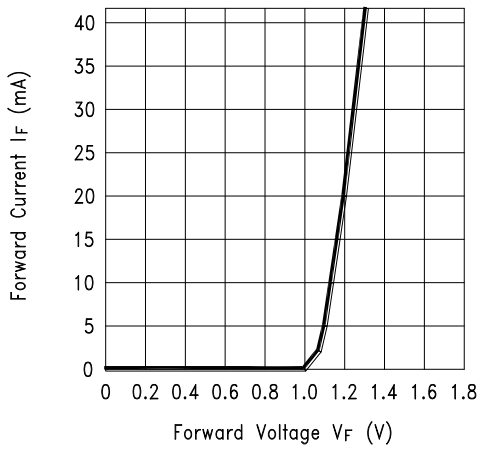


Fig.3 Collector Current vs. Collector−emitter Voltage

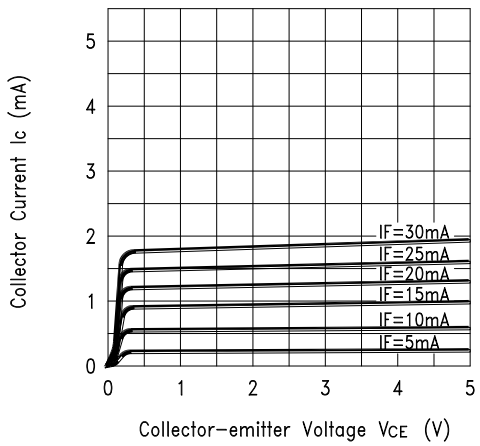
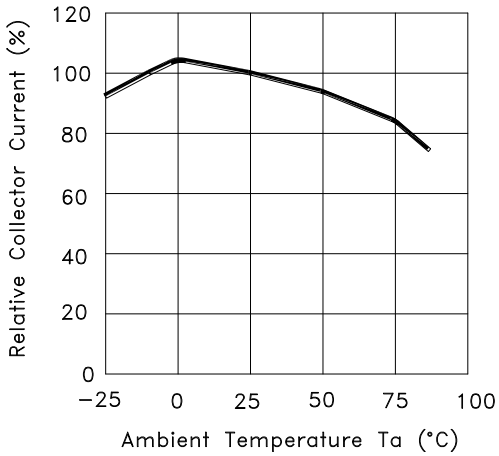


Fig.4 Collector Current vs. Ambient Temperature



No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	10 of 15		Date	Sep. 28, 2012	

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

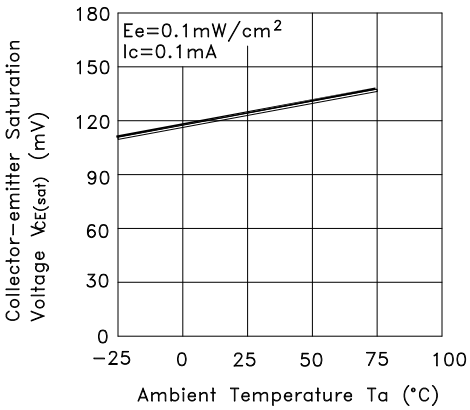


Fig.6 Response Time vs. Load Resistance

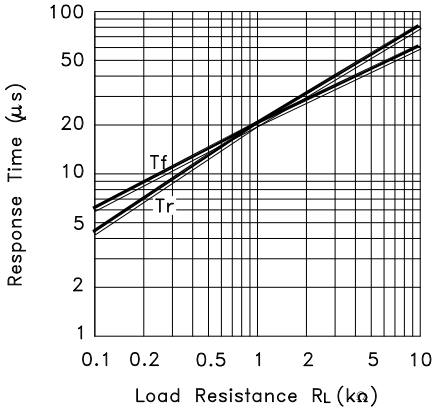
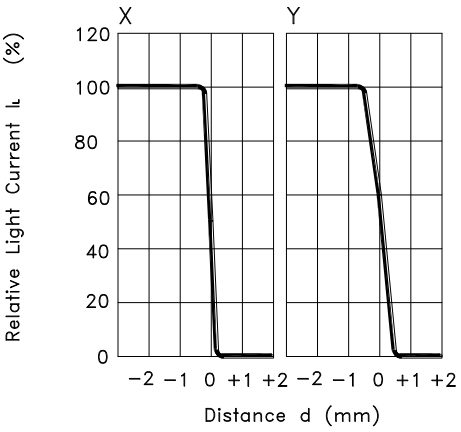
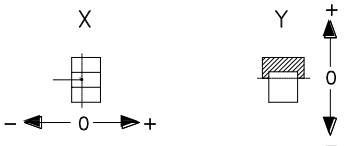


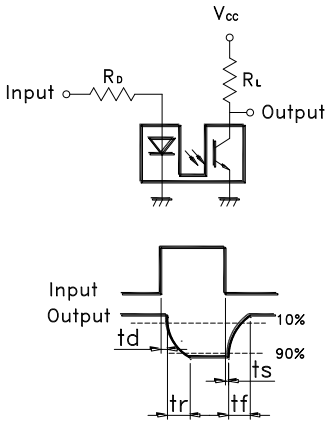
Fig.7 Sensing Position Characteristics (Typical)



(Center of Optical axis)



Test Circuit for Response Time



No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	11 of 15		Date	Sep. 28, 2012	

● ELECTRICAL CHARACTERISTICS

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

● RELIABLE TEST ITEMS

Test Item	Standard	Contents
IR Reflow	MIL-STD-202G, TEST METHOD 210F、IPC/JEDEC J-STD-020D	Peak temp.=255~260℃ *3times
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	IF=20 mA VCE=5 V TIME:1,000 hrs
Pull Force of Terminals	--	500 GF，1 minutes

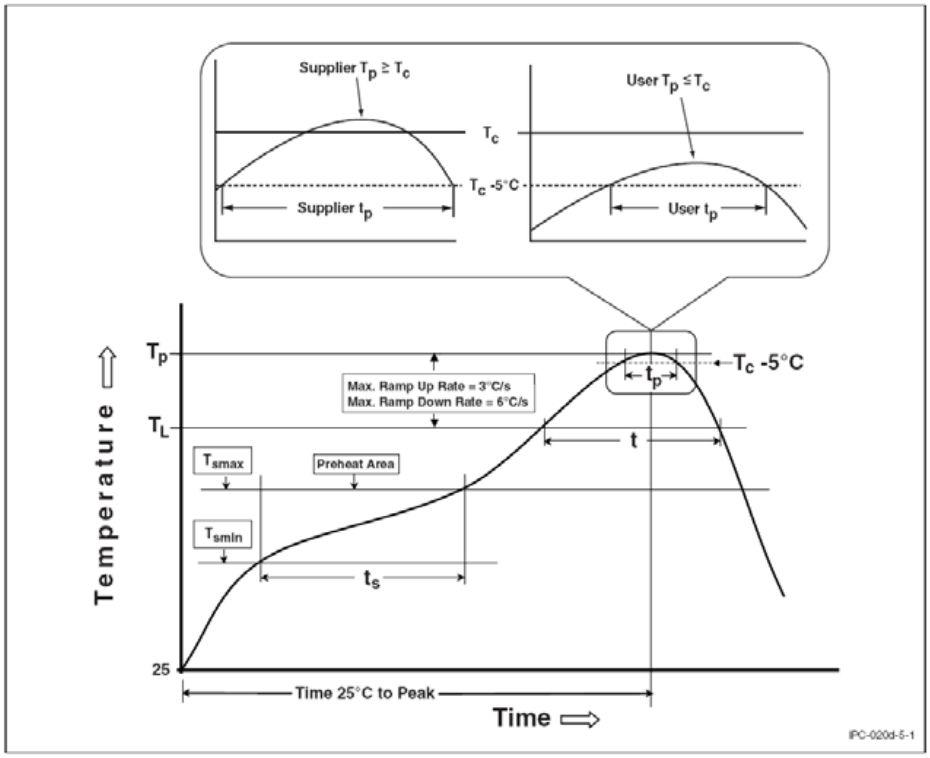
No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	12 of 15		Date	Sep. 28, 2012	

- Conditions of IR Reflow

  Following reflow information is for reference only, we suggest users to process as per the recommendation of soldering flux manufacturer.



Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	13 of 15		Date	Sep. 28, 2012	

< 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.		

● Soldering Temperature and Times(For DIP Type)

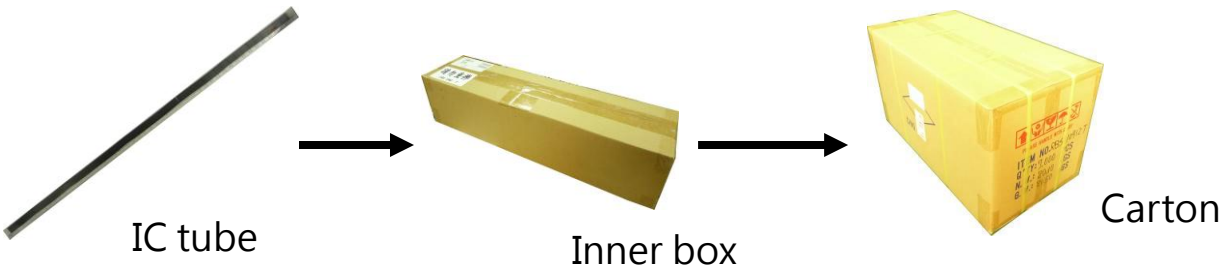
Condition / Soldering Method	Soldering Temperature	Times for Soldering
Manual soldering	260 ± 5°C	< 5 Sec. Max
Wave soldering	260 ± 5°C	< 5 Sec. Max

Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	14 of 15		Date	Sep. 28, 2012	

● 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.



Item.#	RBS3303 Series	Description	ROLL BALL SWITCH	Version	V101.7
Page	15 of 15		Date	Sep. 28, 2012	

● 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.).

No. 278, 4 Sec., Tzuyu Rd.,
E. Dist., Taichung 40147, Taiwan
http://www.oncque.com

Tel: 886-4-22122715
Fax: 886-4-22122717
E-mail: oncque@oncque.com.tw