SENSOR SWITCH

Item.#	VBS04 Series	Description	ROLL BALL SWITCH	Version	V101.2
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● FUNCTIONS

Omni-directional Vibration Detecting

● APPLICATIONS

1. Wake up systems for power saving, Such like remote controllers
2. GPS starting system
3. Alarm system
4. Anti-theft、Anti-tampered devices.
5. Automatically flashing for bike lamp
6. Subsidiary night lamp flashing for car
7. Outsole of sporting shoes flashing
8. Toys

● 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. RoHS compliance, an ideal substitute for mercury switch.
6. A more economical vibration detection option than IC design solution.
7. All made in Taiwan and examined before shipment.

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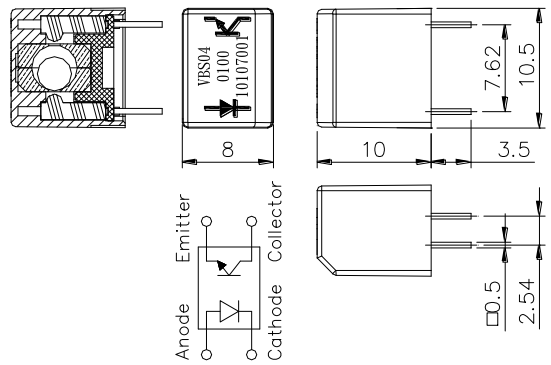
- PATENTS

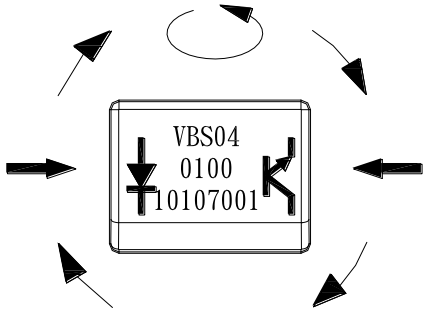
1. TAIWAN Patent No. I 226467
2. U.S.A. Patent No. US 6,740,867 B2
3. CHINA Patent No. ZL 02 1 46662.9

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

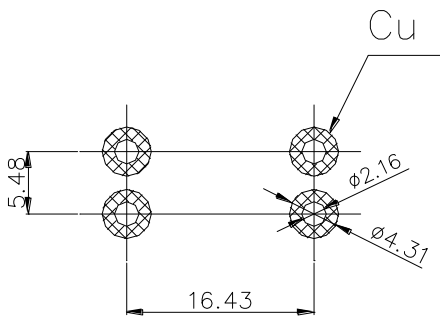
VBS 04 01 00



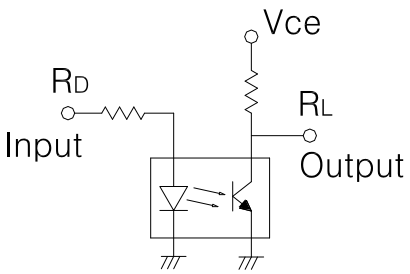
Operation Angle



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



Application Circuit



1.Vce=5V
2.RD=430ohn
3.RL=33Kohn

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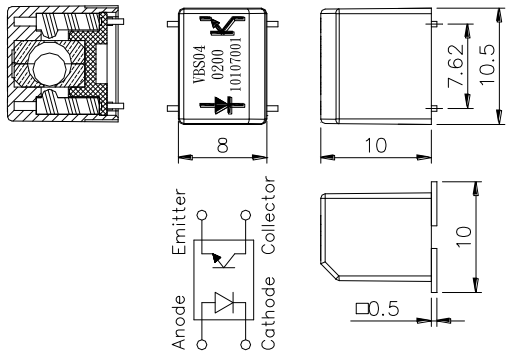
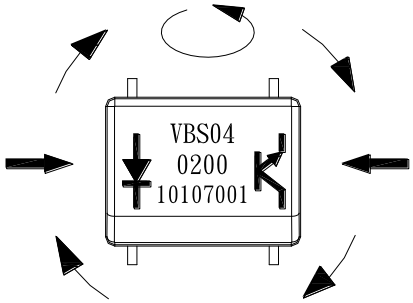
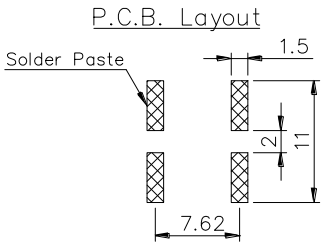
VBS 04 02 00



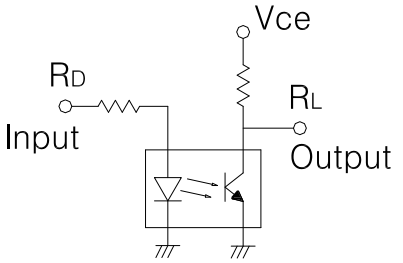
Operation Angle



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



Application Circuit



1.Vce=5V
2.RD=430ohn
3.RL=33Kohn

● Current/Voltage Suggested

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

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● 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

● MECHANICAL CHARACTERISTICS

1.	Temperature Range	Operating: -25°C to +85°C 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.

● 光電、電性特性 (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	-	5	-	μsec
Fall Time	Tf	Vcc=30v RL=1KΩ	-	5	-	μsec

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

Fig.1 Power Dissipation vs. Ambient Temperature

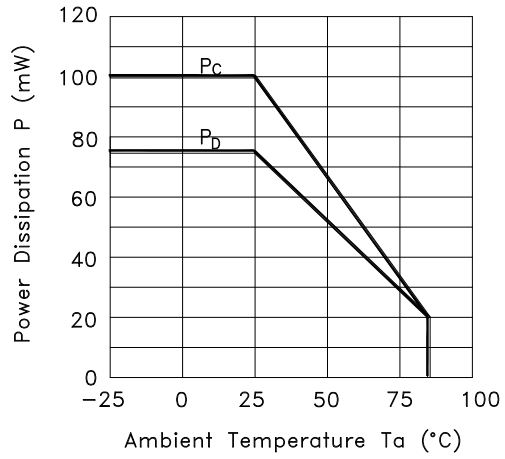


Fig.2 Forward Current vs. Forward Voltage

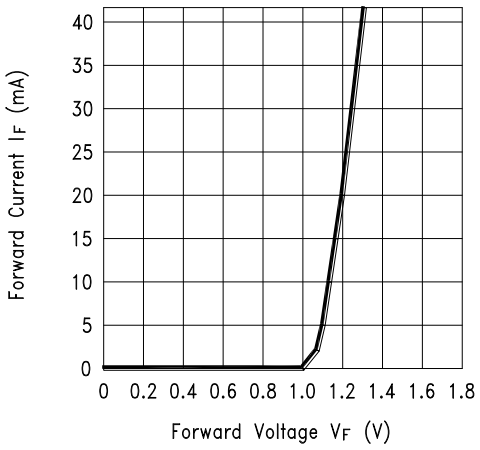


Fig.3 Collector Current vs. Collector−emitter Voltage

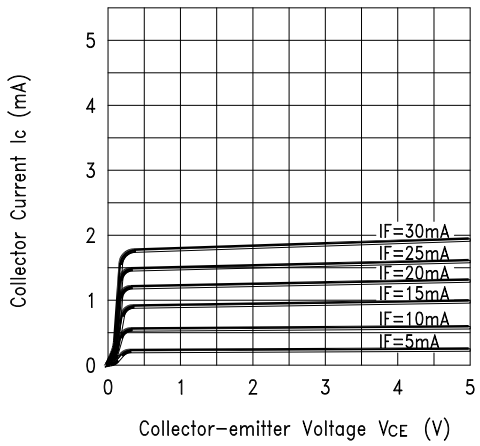


Fig.4 Collector Current vs. Ambient Temperature

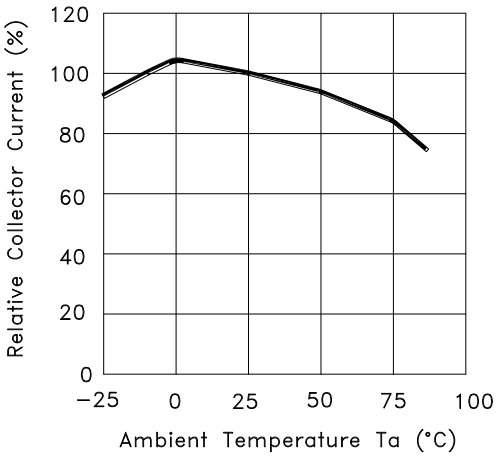


Fig.5 Collector-emitter Saturation Voltage vs. Ambient Temperature

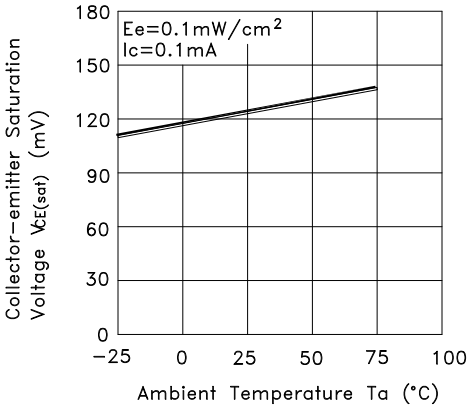


Fig.6 Response Time vs. Load Resistance

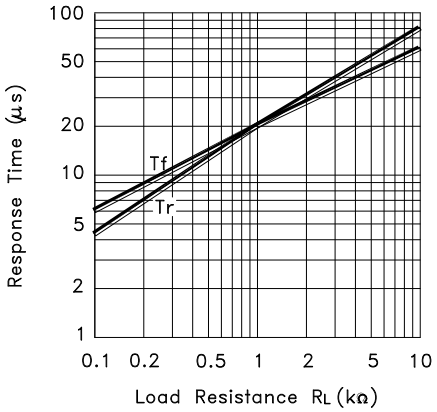
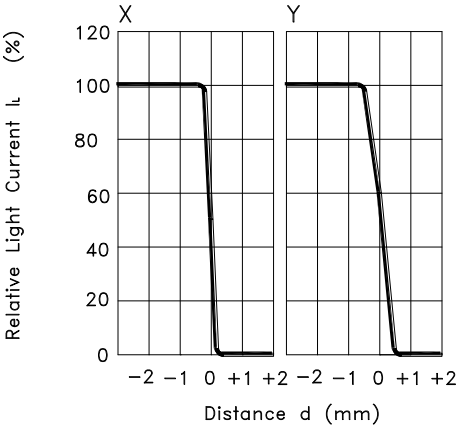
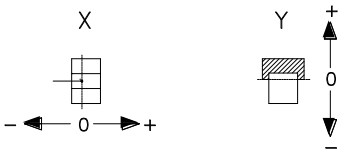


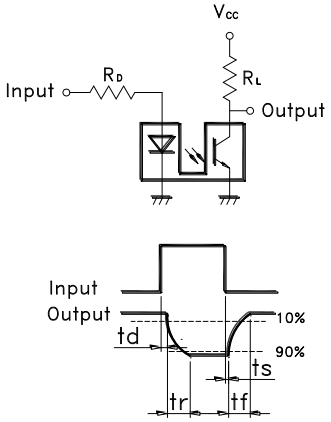
Fig.7 Sensing Position Characteristics (Typical)



(Center of Optical axis)



Test Circuit for Response Time



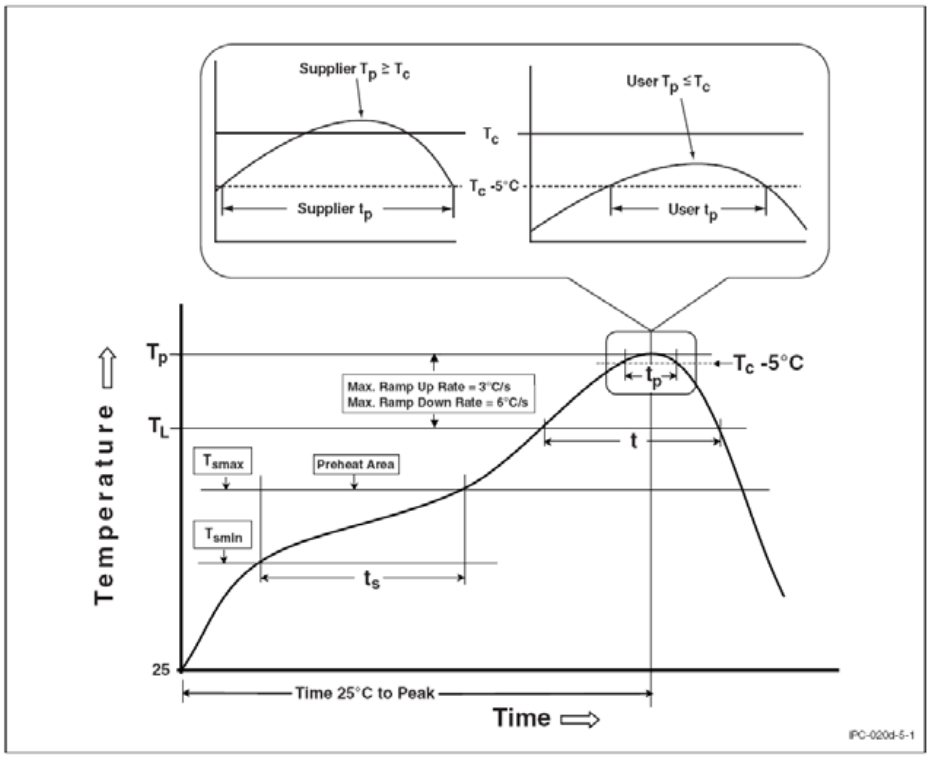
● Reliable Test Items

Reliable Test

Test Item	Standard	Contents
Storage Temperature	MIL-STD-202G, TEST METHOD 107G, TEST A	-40℃~85℃
IR Reflow	MIL-STD-202G, TEST METHOD 210F、IPC/JEDEC J-STD-020D	Peak temp.=255~260℃ *3times
Humidity	MIL-STD-202G, TEST METHOD 103B	40℃/95%RH
Operating Temperature	MIL-STD-202G, TEST METHOD 107G, TEST A	-25℃~85℃
Mechanical Life	--	2Hz Horizontal
Electrical Life	MIL-STD-883E:1016	IF=20mA VCE=5V TIME:1,000 hrs

● IR Reflow Reference Profile (For SMT Type)

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



< 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
Soldering-iron	260 ± 5°C	< 5 Sec. Max
Wave	260 ± 5°C	< 5 Sec. Max

● PACKAGE

	Part Number	Package	Quantity	Total	Dimension(mm)
1.	VBS040100	IC bube	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 shown as below for reference.

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	Part Number	Package	Quantity	Total	Dimension(mm)
1.	VBS040200T	Tape & reel	350 pcs	350 pcs	φ330*25H
		Inner box	2 Reels	700 pcs	355L*340W*68H
		Carton	10 boxes	7,000 pcs	705L*365W*375H

※ Package shown as below for reference.

Tape & Reel　　Inner box　　Carton

● 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.

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● 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.).

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