Tilt Sensor Switch

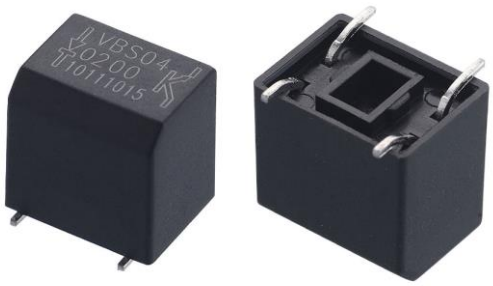
Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	1 of 13		Publish Date	Jul. 03, 2018	

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

● PATENTS

1. Taiwan Patent No. I 226467
2. U.S.A. Patent No. US 6,740,867 B2
3. China Patent No. ZL 02146662.9

No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

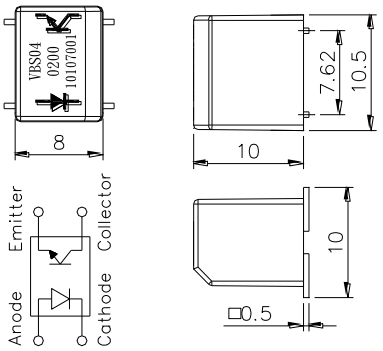
Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	2 of 13		Publish Date	Jul. 03, 2018	

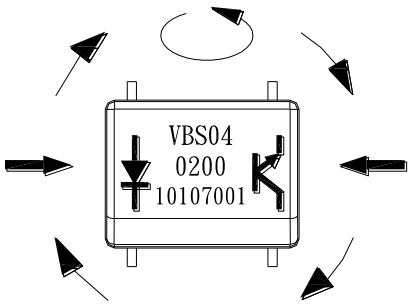
● DIMENSIONS / OPERATION / P.C.B. LAYOUT (Unit: mm, Tolerance: ±0.25mm)

Fig. 1

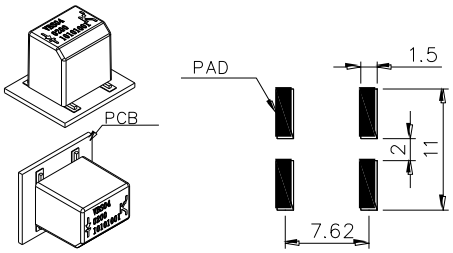
VBS 04 02 00 T



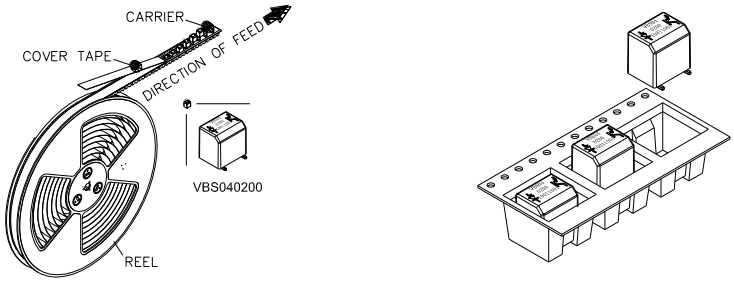
Operation Diagram



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



TAPE & REEL



Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	3 of 13		Publish Date	Jul. 03, 2018	

● Absolute Maximum Rating（Ta=25°C）

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	°C
Storage Temperature		Tstg	-40~+85	°C
Soldering Temperature (*2)		Tsol	260	°C

(*1) tw=100 μSec., T=10 mSec.
(*2) t=5 Sec

No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	4 of 13		Publish Date	Jul. 03, 2018	

● 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	λp	I_F=10mA		940		nm
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	22	mA
The variation of light current when vibration	△Ic	V_{CE}=5V I_F=20mA	-	0.2	-	mA
Rise Time	Tr	I_C=0.8mA V_{CC}=30V R_L=1KΩ	-	5	-	μsec
Fall Time	Tf		-	5	-	μsec

No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	5 of 13		Publish Date	Jul. 03, 2018	

- Schematic Design

  In schematic design, we suggest the design current equal to the half of rated current, we get VBS04,

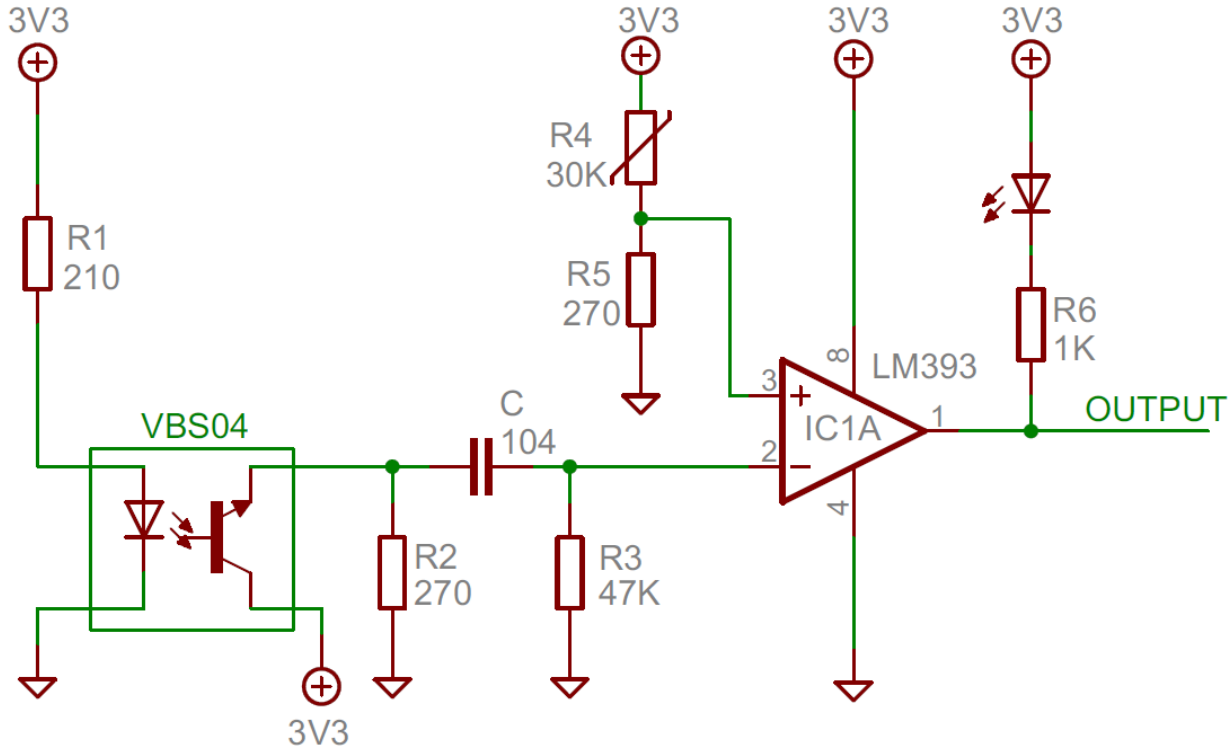
  Current of Emitter (IR) I_F= 10 mA

  Current of Receiver (PT) Ic = 0.25 ~ 11.0 mA

  When vibration, the varied current at Receiver (PT) △Ic ≒ 0.1 mA

Adjustment of the input divided voltage of LM393 (pin3), the sensitivity is adjusted.

- Schematic 1 (Power supply for 3.3V)



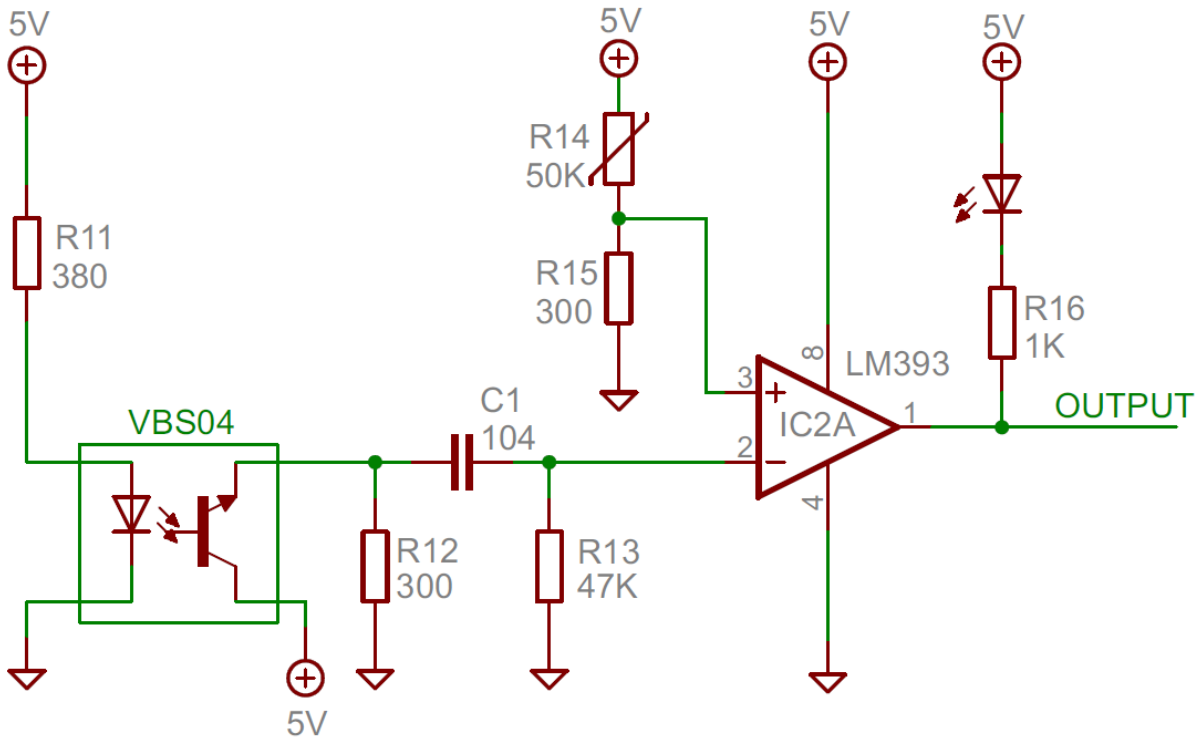
No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	6 of 13		Publish Date	Jul. 03, 2018	

● Schematic 2 (Power supply for 5V)



No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	7 of 13		Publish Date	Jul. 03, 2018	

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

Fig.1 Power Dissipation vs. Ambient Temperature

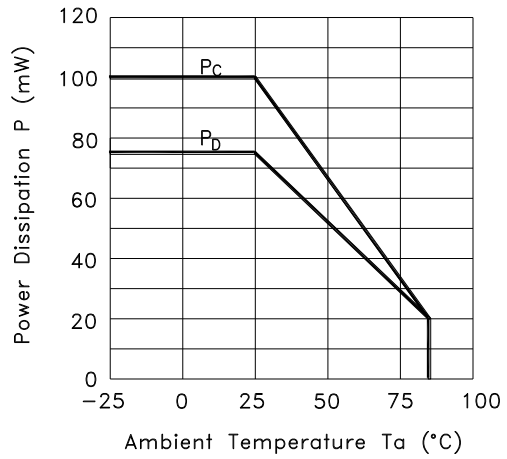


Fig.2 Forward Current vs. Forward Voltage

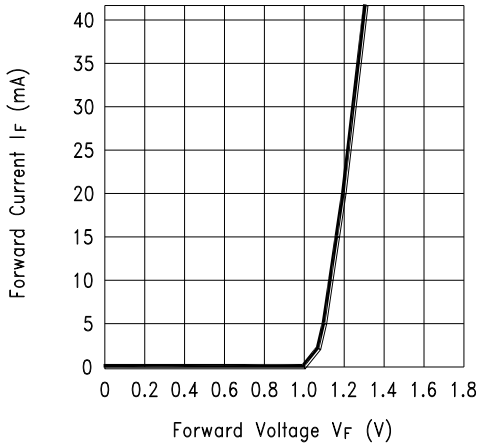


Fig.3 Collector Current vs. Collector−emitter Voltage

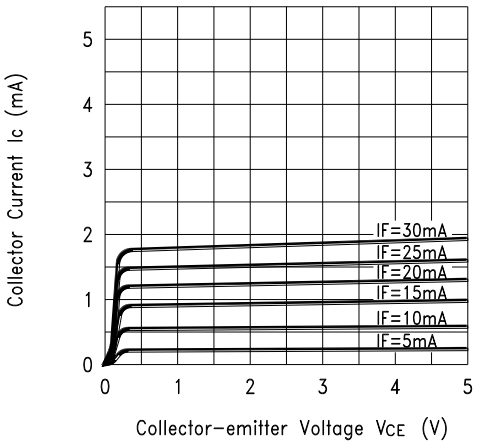
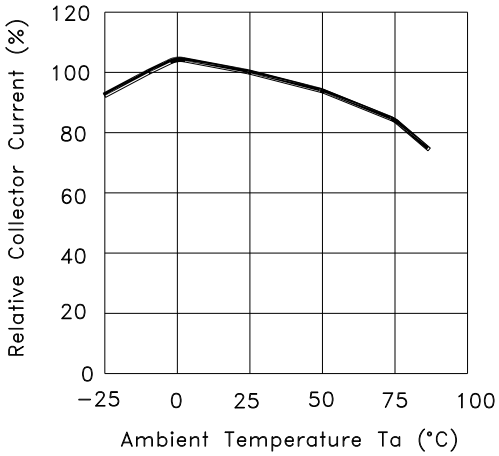


Fig.4 Collector Current vs. Ambient Temperature



No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	8 of 13		Publish Date	Jul. 03, 2018	

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

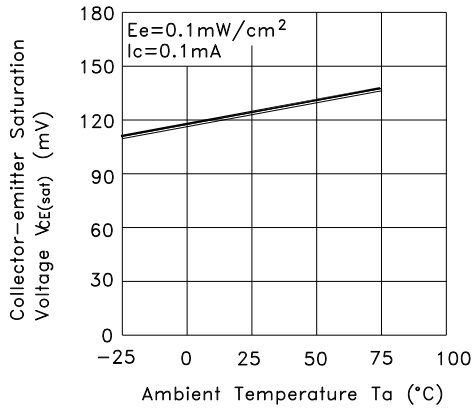


Fig.6 Response Time vs. Load Resistance

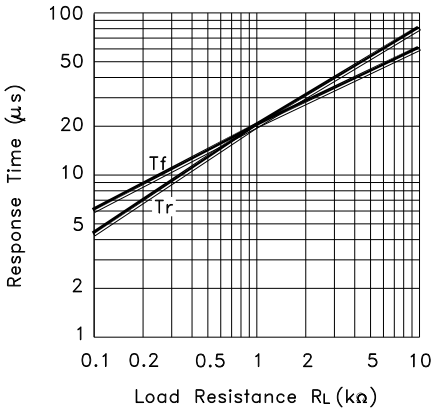
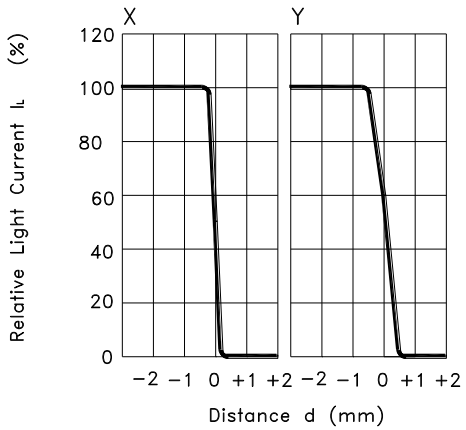
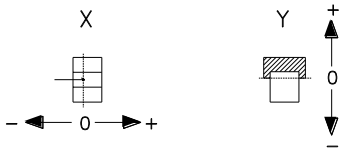


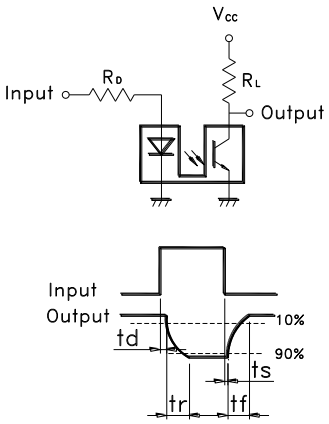
Fig.7 Sensing Position Characteristics (Typical)



(Center of Optical axis)



Test Circuit for Response Time



Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	9 of 13		Publish Date	Jul. 03, 2018	

● RELIABLE TEST ITEMS

Reliable Test for VBS040200T

	Test Item	Contents
1	IR Reflow	Peak temp.=255~260°C
2	Operating Temperature	-25°C ~ 85°C
3	Storage Temperature	-40°C ~ 85°C
4	Humidity	40 °C / 95 %RH
5	Mechanical Life	2Hz, horizontal 1,000,000 times
6	Electrical Life	I_F=20 mA, V_{CE}=5 V TIME: 30,000 hrs

● SOLDERING CONDITION

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

Condition / Suitable Production Process	Soldering Temperature	Soldering Time	Wattage of Manual Soldering	Type
IR Reflow	Please refer to following < Table of classification Reflow profile > and Fig. 2		-	SMD
Manual Soldering	300±5°C	< 3 seconds max.	30W or Temperature-controlled manual soldering	SMD

No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	10 of 13		Publish Date	Jul. 03, 2018	

< 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.		

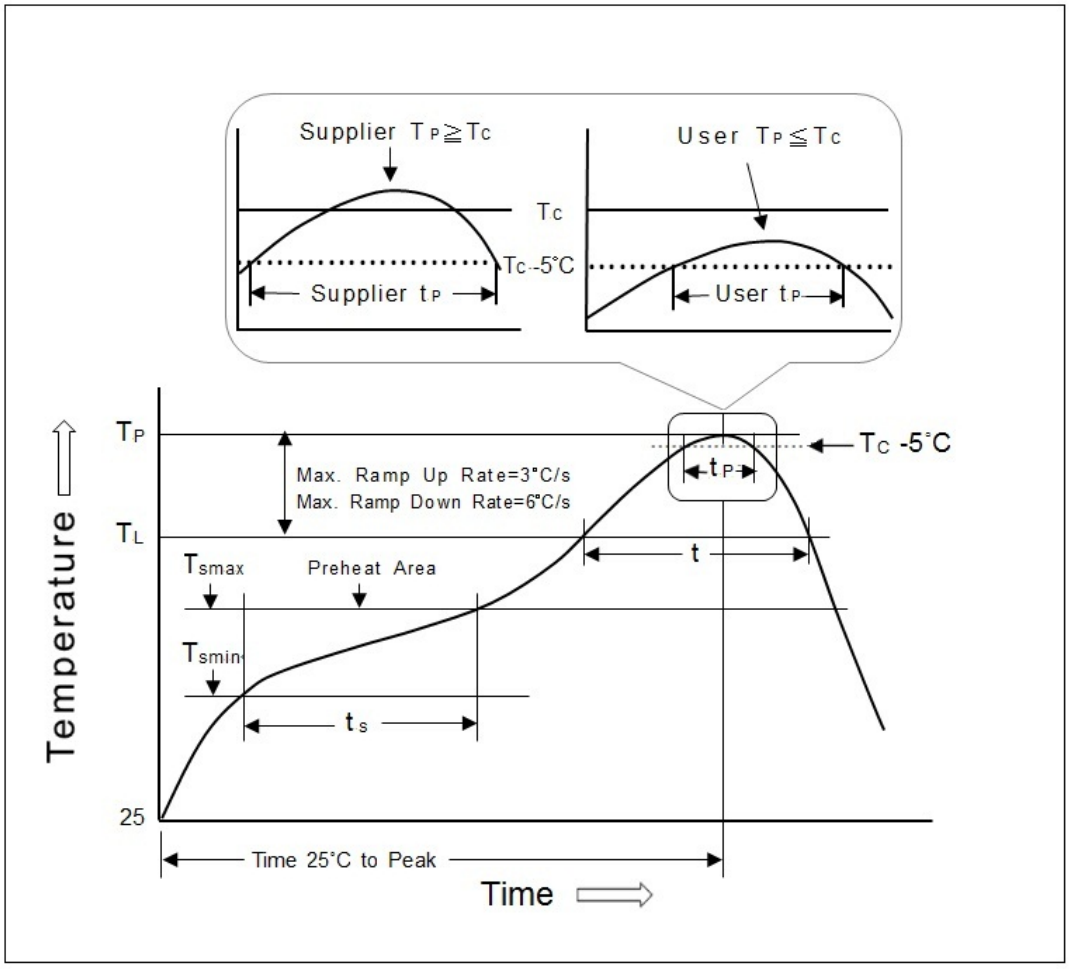
No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	11 of 13		Publish Date	Jul. 03, 2018	

Fig. 2



Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	12 of 13		Publish Date	Jul. 03, 2018	

● PACKAGE

	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	703L*364W*380H

※ Package shown as below for reference.



Tape & Reel　　Inner box　　Carton

No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw

Tilt Sensor Switch

Item No.	VBS040200T	Description	Photoelectric	Version	9
Page	13 of 13		Publish Date	Jul. 03, 2018	

● 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. 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 electrostatic protective treatment, for example: wearing a conductive wrist strap or antistatic gloves during production process, grounding machinery etc.

No.1, Jingke 3rd Rd., Nantun Dist.,
Taichung City 40852, Taiwan
http://www.oncque.com

Tel: +886-4-23588178
Fax:+886-4-2358-3555
E-mail: oncque@oncque.com.tw