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## PIR / Microwave sensor control chip

### Outline

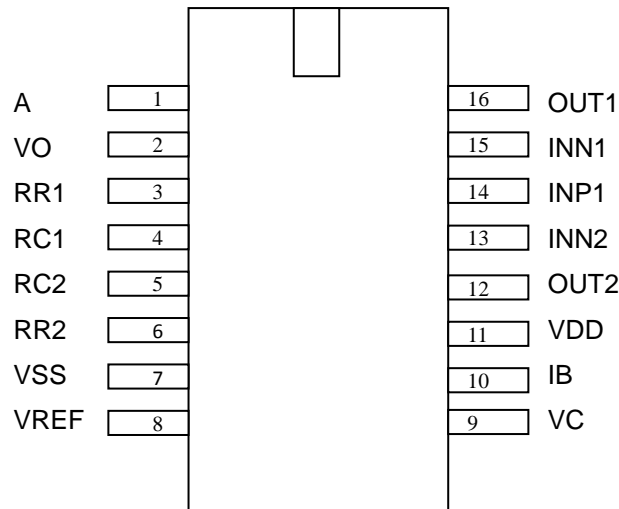
- TT0002 is a CMOS chip designed to human infrared sensor control integrated circuits; it is a kind of high-performance sensor signal processing integrated circuit (IC) which together with PIR sensor and outward elements to constituent PIR switch. It can automatically and quickly open such devices as incandescent lamps, fluorescent lamps, buzzers, automatic valves, electric fans, dryers and automatic hand-washing facilities. IC is especially suitable for enterprises, hotels, shopping malls, warehouses, passages or corridors of houses, automatic lights, lighting systems and alarm systems.
- It can use PHOTO transistor or CDS application. The chip is equipped with amplifiers, comparator, timer, control circuits, system oscillator, and output timing oscillator. Its PIR sensor or MICROWAVE sensor detects infrared power variation induced by the motion of a human body and transforms it to a voltage variation. If PIR output voltage variation conforms to the criteria, then the lamp is turned on with an adjustable duration.

### Characteristic

- Voltage operating range : 1.8V ~ 6.0V
- Low power CMOS technology ( ideal for battery operated PIR devices )
- CMOS high input impedance operational amplifiers
- Bi-directional level detector / Excellent noise immunity
- Built-in Power up disable & output pulse control logic
- Dual mode : retriggerable & non-retriggerable
- Package for 16 SOP

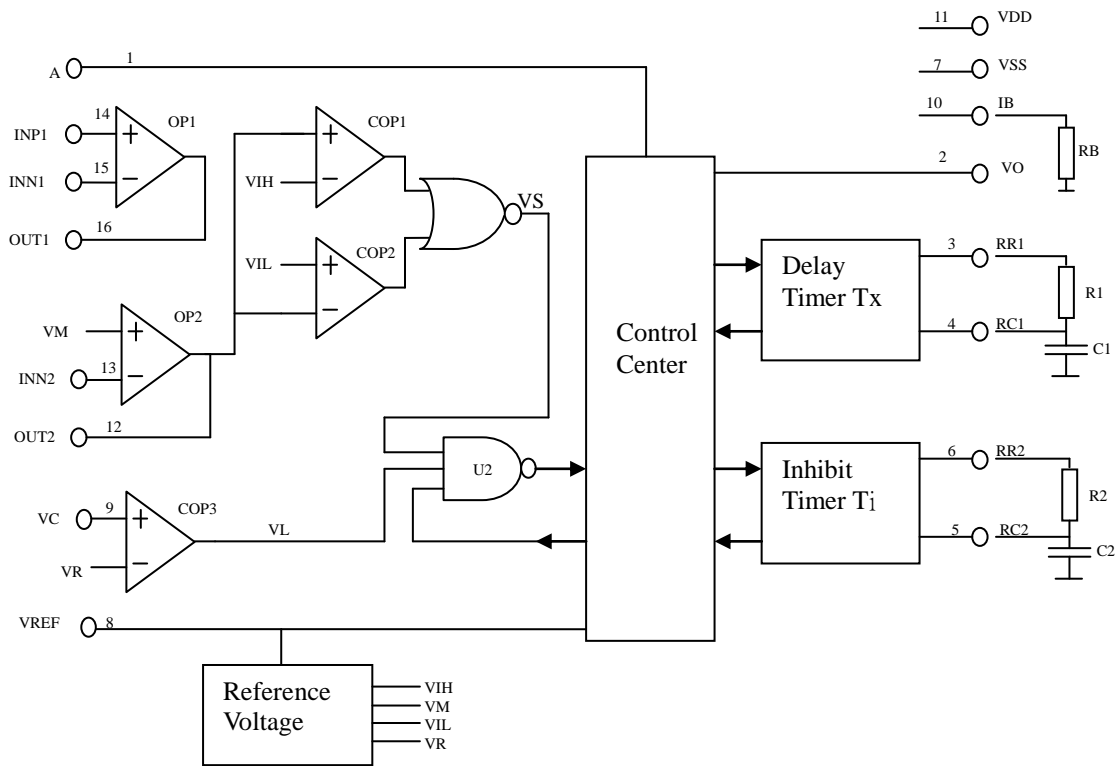
### Applications

- Human infrared sensor lights
- Automatic energy-efficient lighting occasions like garden, garage, hallway, stairs
- Monitoring, alarm, doorbell system like home, shops, offices, factories
- Automatic switching system like exhaust fans, ceiling fans

**IC Pin diagram and description**


Compatible with BISS0001

Pin name	Pin Description
A	Retriggerable & non-retriggerable mode select ( A = 0 : non- retriggerable , A = 1 : retriggerable )
VO	Detector output pin ( active high )
RR1	Output pulse width control ( Tx )
RC1	Output pulse width control ( Tx )
RC2	Trigger inhibit control ( Ti )
RR2	Trigger inhibit control ( Ti )
VSS	Ground
VREF	RESET & voltage reference input
VC	Trigger disable input ( VC > 0.2VDD = enable ; VC < 0.2VDD = disabled )
IB	Op-amp input bias current setting ( RB connect to VSS , RB about = 1.5MΩ )
VDD	Supply voltage ( 1.8V ~ 6.0V )
OUT2	2 <sup>nd</sup> stage Op-amp output
INN2	2 <sup>nd</sup> stage Op-amp inverting input
INP1	1 st stage Op-amp non-inverting input
INN2	1 st stage Op-amp inverting input
OUT1	1 st stage Op-amp output

**IC Internal functional diagram**


$VR \approx 0.2VDD$ ,  $VM \approx 0.5VDD$

Bi-directional level detector  $VIH \approx 0.7VDD$ ,  $VIL \approx 0.3VDD$

**Electrical Characteristics**

- Limiting values

Parameter	Symbol	Condition	Rating	Unit
Operating Temperature	T <sub>OP</sub>	—	-20 ~ +70	°C
Storage Temperature	T <sub>STG</sub>	—	-65~+150	°C
Supply Voltage	V <sub>IN</sub>	T <sub>a</sub> =25°C	VSS-0.5~VSS+6.5	V
Input Voltage	V <sub>I</sub>	T <sub>a</sub> =25°C	VSS-0.5~VIN+6.0	V

Note : VSS symbolizes for system ground

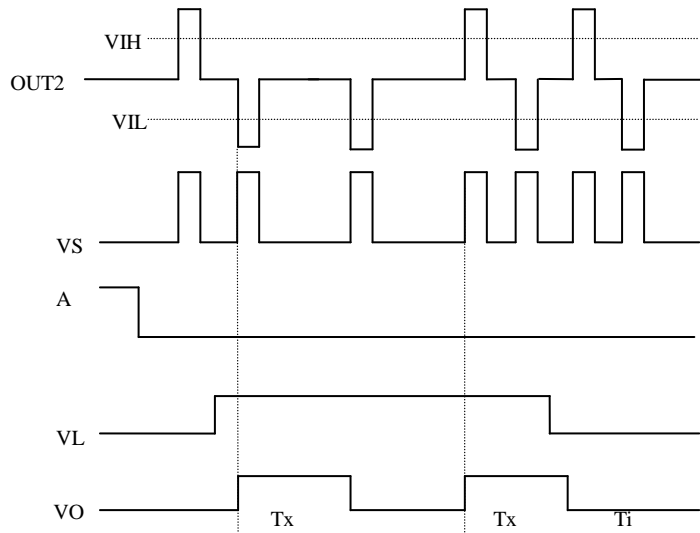
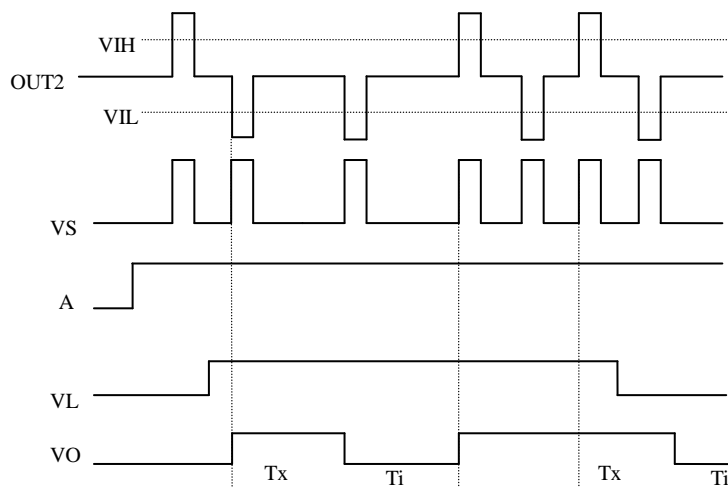
- DC / AC characteristics : ( Test condition at room temperature 25 °C )

Parameter	Symbol	Test Conditions	Values			Unit	
			Min	Typ	Max		
Operating Voltage	VDD	—	1.8	-	6.0	V	
Operating Current	IDD	Output no load	RB=1.5MΩ @VDD=3V	-	20	30	uA
			RB=2.0MΩ @VDD=3V	-	15	25	
			RB=1.5MΩ @VDD=5V	-	30	45	
			RB=2.0MΩ @VDD=5V	-	20	40	
Input voltage	VOS	VDD=5V	-	-	50	mV	
Input current	IOS	VDD=5V	-	-	50	nA	
Open loop gain	AVN	VDD=5V RL=1.5MΩ	60	-	-	dB	
common-mode rejection ratio	CMRR	VDD=5V RL=1.5MΩ	60	-	-	dB	
OP output Hi	VYH	VDD=5V	4.25	-	-	V	
OP output Low	VYL	RL=500KΩ & 1/2VDD	-	-	0.75	V	
VC input Hi	VKH	VREF=VDD=5V	1.1	-	-	V	
VC input Low	VRL		-	-	0.9	V	
VO output Hi	VOH	VDD=5V IOH=0.5mA	4	4.8	-	V	
VO output Low	VOL	VDD=5V IOL=0.1mA	-	0.1	0.4	V	
A input Hi	VAH	VDD=5V	3.5	-	-	V	
A input Low	VAL	VDD=5V	-	-	1.5	V	

Note: Resistance RB reference basic application circuit

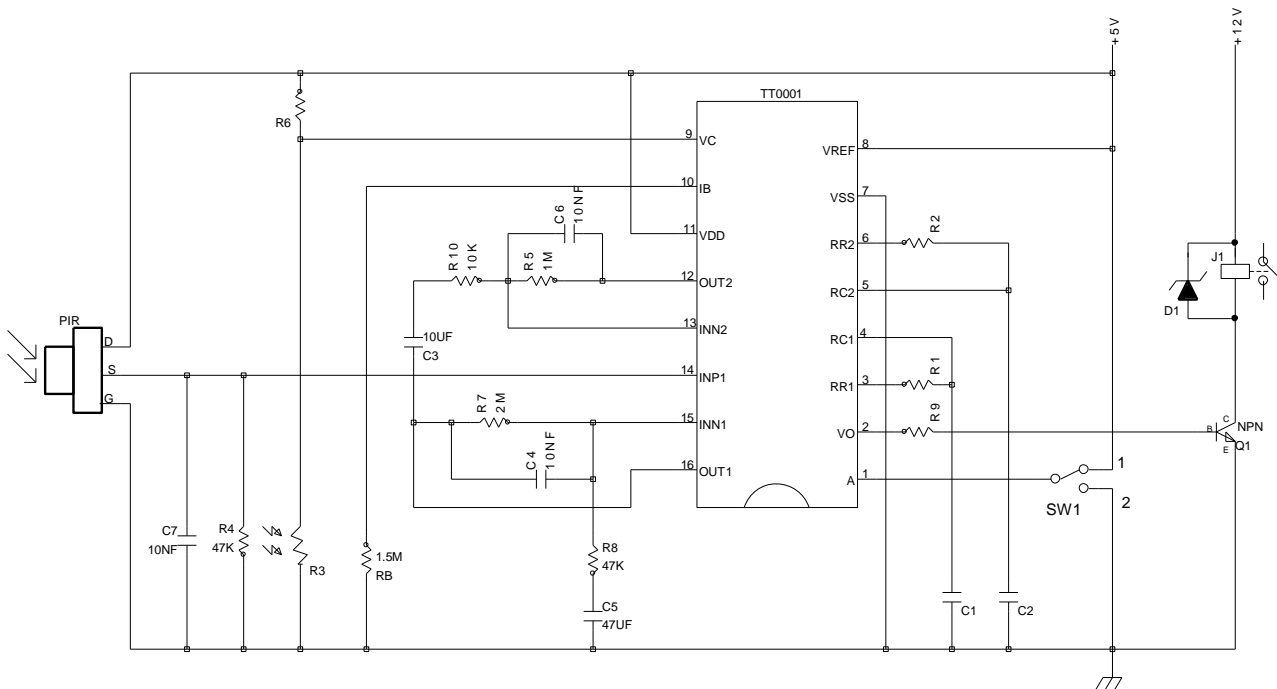
**Function Description**

 Bi-directional level detector  $V_{IH} \approx 0.7V_{DD}$ ,  $V_{IL} \approx 0.3V_{DD}$ 

 Non-retrigerrable waveform ( $A=0$ )

 Retriggerable waveform ( $A=1$ )


## Basic Application Circuit (1)

Reference only



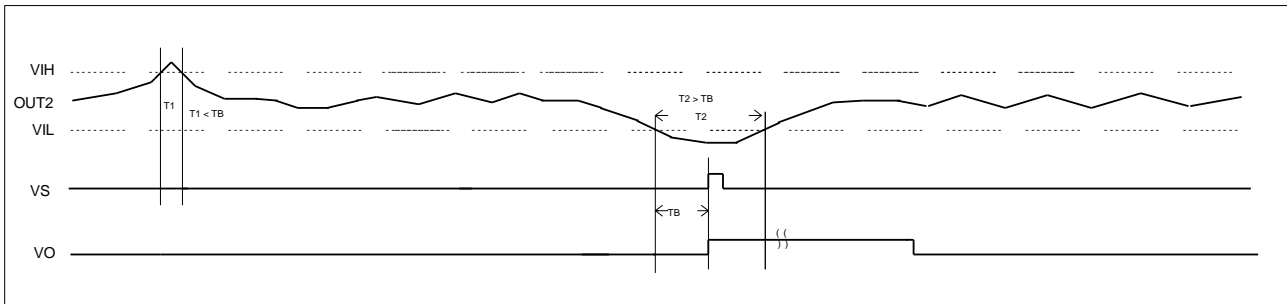
**TX** The delay time and output resistors, capacitors follows :

( Test conditions are not considered stable PIR trigger time, the actual delay time due to steady time increases of PIR application circuit becomes longer )

**RR1RC1** — Delay time TX 。  $TX \approx 49152R1C1$ 。

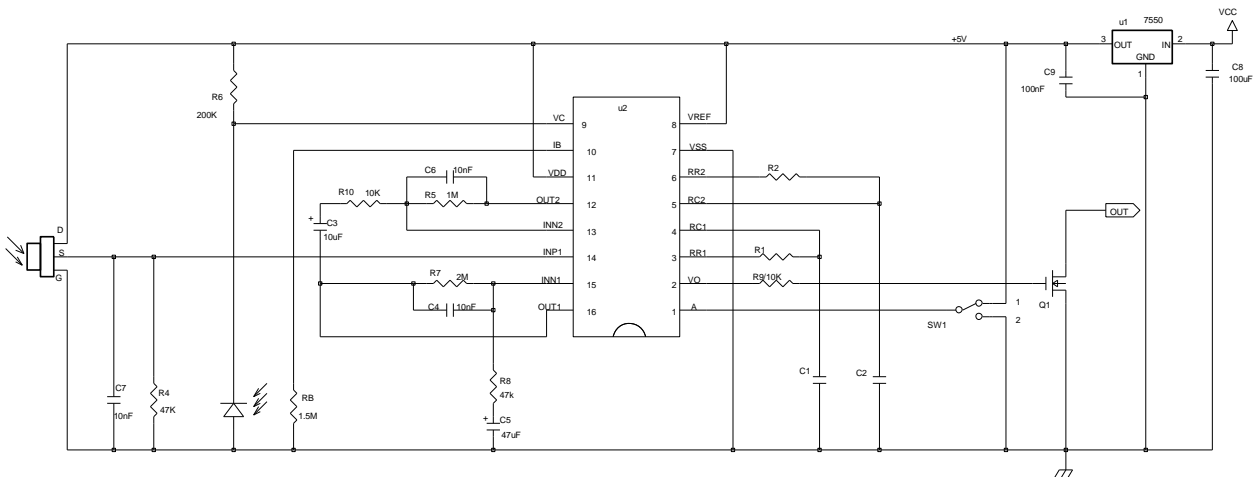
**RR2RC2** — Inhibit time 。  $TI \approx 4096R2C2$ 。  $TB \approx 16R2C2$ 。

RR1RC1 — delay time TX $TX \approx 49152R1C1$				RR2RC2 — inhibit tome TI, De-bounce TB $TI \approx 4096R2C2$ , $TB \approx 16R2C2$					
C1	R1	VDD=5V Tx	VDD=3.3V Tx	C2	R2	VDD=5V		VDD=3.3V	
						TI	TB	TI	TB
0.01uF	22KΩ	6.0 sec	4.6 sec	0.01uF	47KΩ	1.0 sec	4.3 ms	0.8 sec	3.4 ms
0.01uF	47KΩ	13 sec	10 sec	0.01uF	62KΩ	1.4 sec	5.7 ms	1.0 sec	4.4 ms
0.01uF	100KΩ	26 sec	20 sec	0.01uF	91KΩ	2.0 sec	8.3 ms	1.5 sec	6.4 ms
0.01uF	200KΩ	53 sec	40 sec	0.01uF	120KΩ	2.6 sec	10.9 ms	2.0 sec	8.4 ms
0.01uF	330KΩ	87 sec	66 sec	0.01uF	150KΩ	3.3 sec	13.6 ms	2.4 sec	10.5 ms
0.01uF	680KΩ	179 sec	135 sec	0.01uF	180KΩ	3.9 sec	16.3 ms	2.9 sec	12.5 ms
0.01uF	1MΩ	283 sec	198 sec	-	-	-	-	-	-

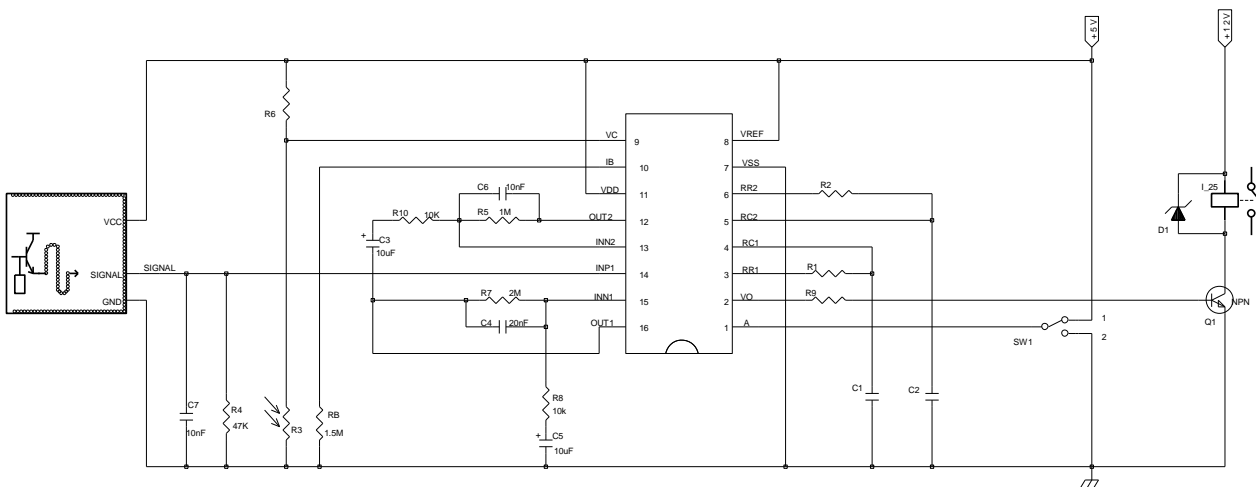
**OUT2 TB (De-bounce timing)**

**PIR Basic Application Circuit (2)**

Reference only

TT0002: 5.5V ~ 24V DC DEMO

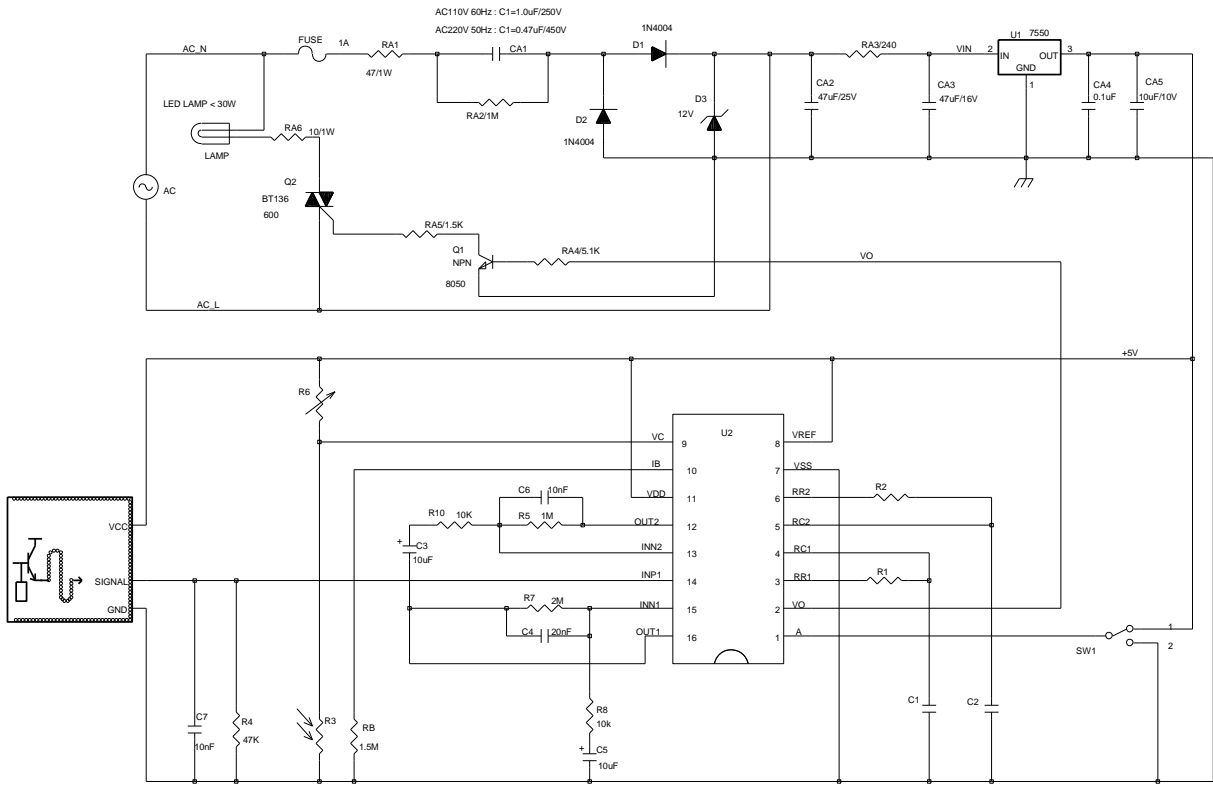

**Microwave Basic Application Circuit (3)**

Reference only



AC 3-lines Microwave Basic TRIAC Application Circuit (4)

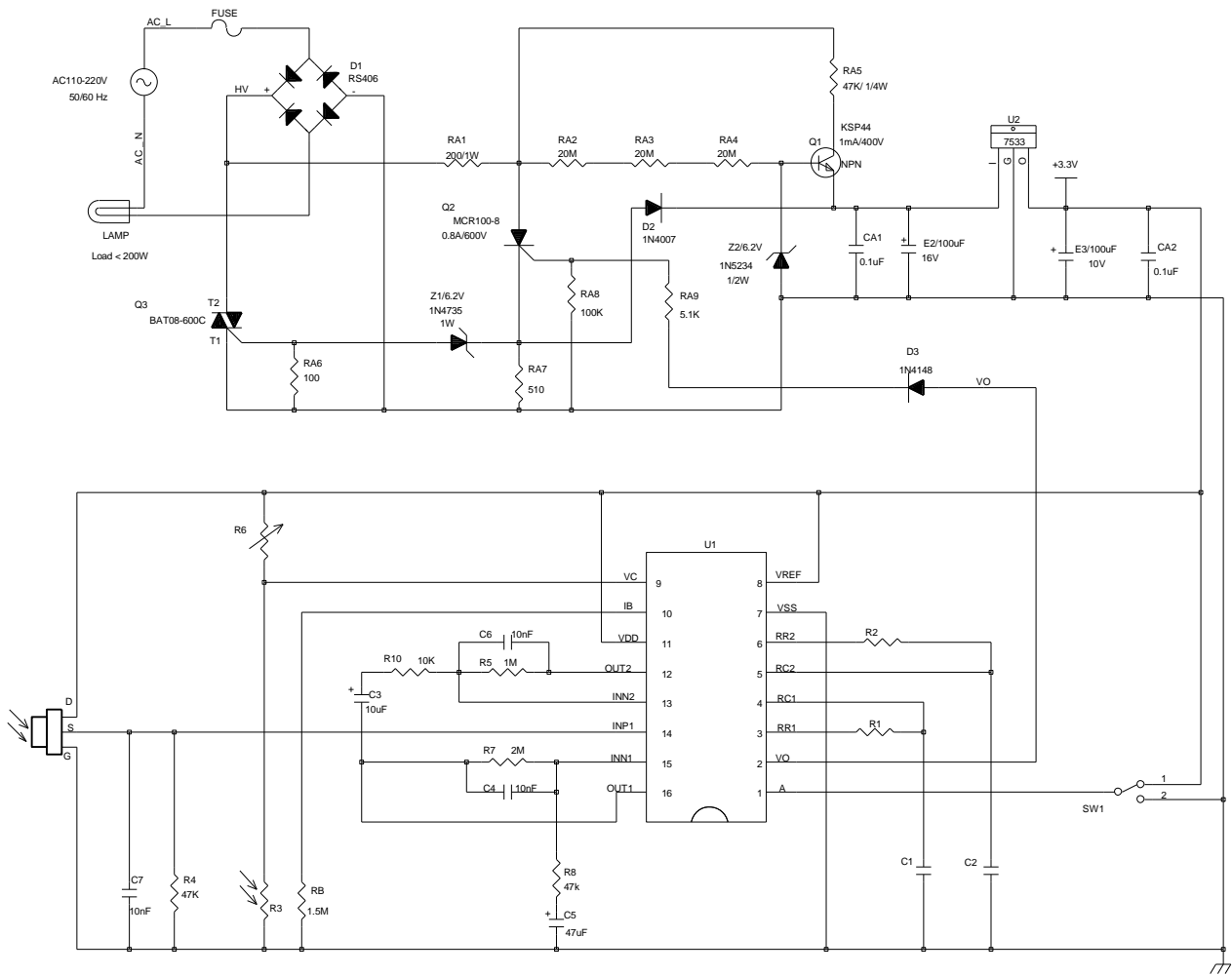
Reference only





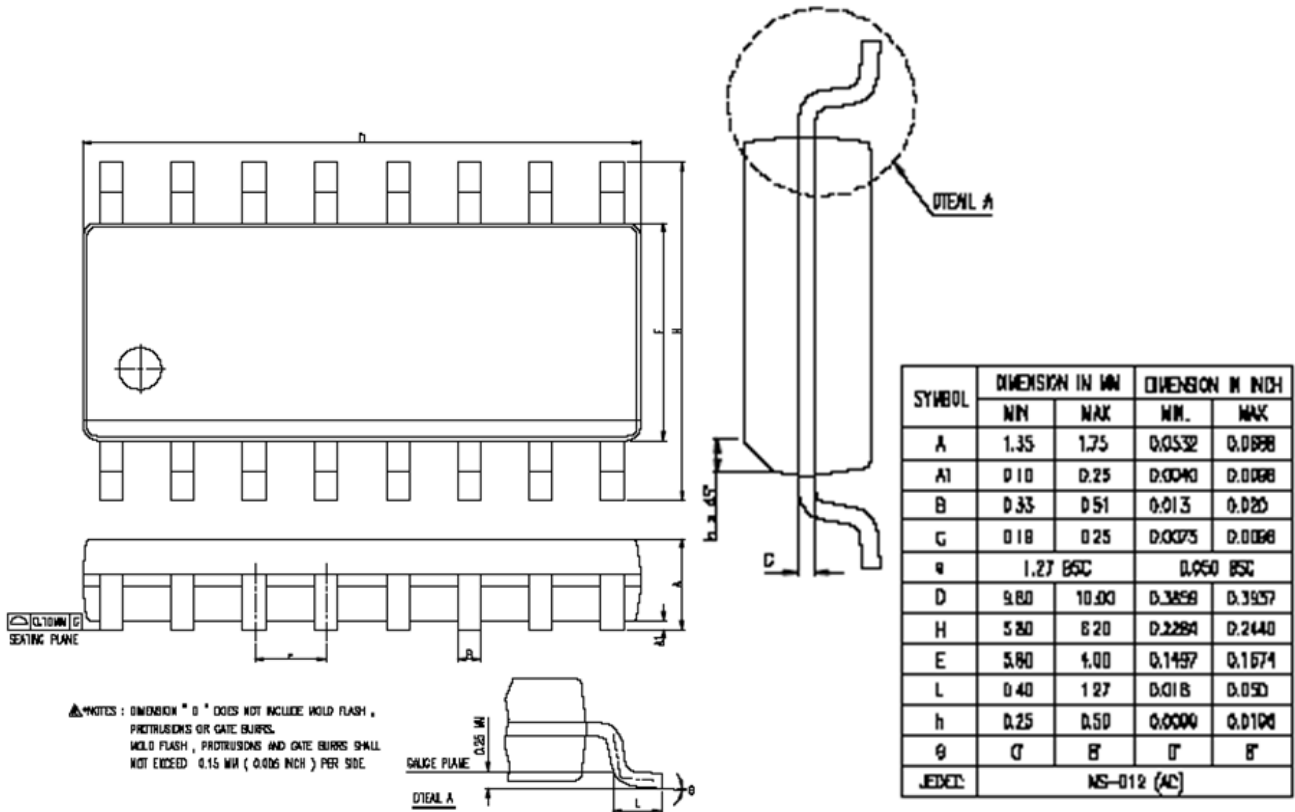
AC 2-lines Microwave Basic TRIAC Application Circuit (5)

Reference only



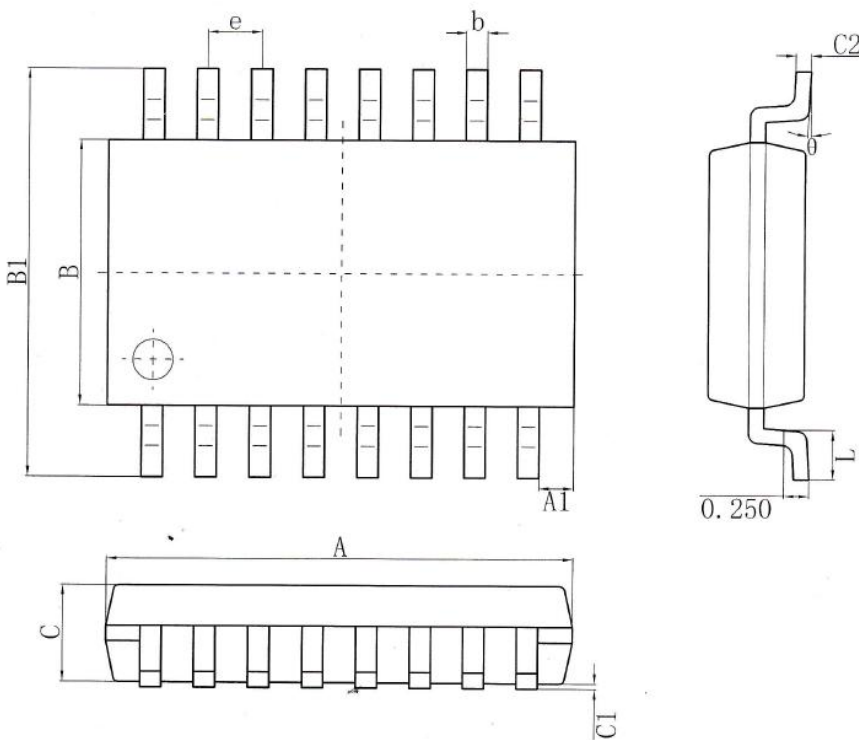
**Descriptions of Packaging**

- SOP 16



- CPC 16**

SYMBOL	MIN.(mm)	MAX.(mm)	SYMBOL	MIN.(mm)	MAX.(mm)
A	4.50	4.70	C	0.85	1.05
A1	0.29	0.39	C1	0.00	0.15
e	0.53(BSC)		C2	0.15	0.18
B	2.50	2.70	L	0.40	0.60
B1	3.85	4.15	$\theta$	0°	8°
b	0.16	0.26			



**Ordering Information****TT0002**

<b>Package Type</b>	<b>Chip Type</b>	<b>Wafer Type</b>
TT0002	—	—

**REVISION HISTORY:**

- 2017/11/03: Initial version 1.1.
- 2017/11/13: update application circuit (5) version 1.2.
- 2017/11/22: add CPC 16 Package version 1.3.