Micro Power PIR signal Op Amp

Patent Number

Taiwan: M455864

China: ZL 2013 2 0099927.6

General Description

TTY020 is a micro power CMOS chip IC design to detect PIR signal control IC. PIR sensor detect infrared power variation induced by the motion of a human body and transforms it to a voltage variation signal. TTY020 use unique **variation window** technology and have **warm up fast** steady time, low power consumption, few external components needed, high sensitivity, steady work feature. The device wide can be used to need PIR controller IC product

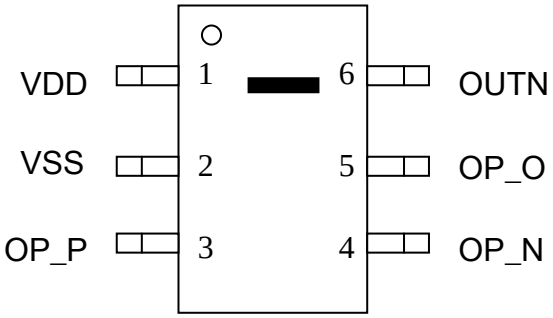
Feature

- Operating voltage range : 2.4V ~ 5.5V。
- Operating current, no load : 25uA@VDD=3V。
- Provide warm up fast steady time : 10sec@VDD=3V。
- During warm up fast steady time, OUTN active low 。
- Unique variation window detect technology can improve noise ability。
- Simple application circuit 。
- 6 PIN package (SOT23-6)。

Application

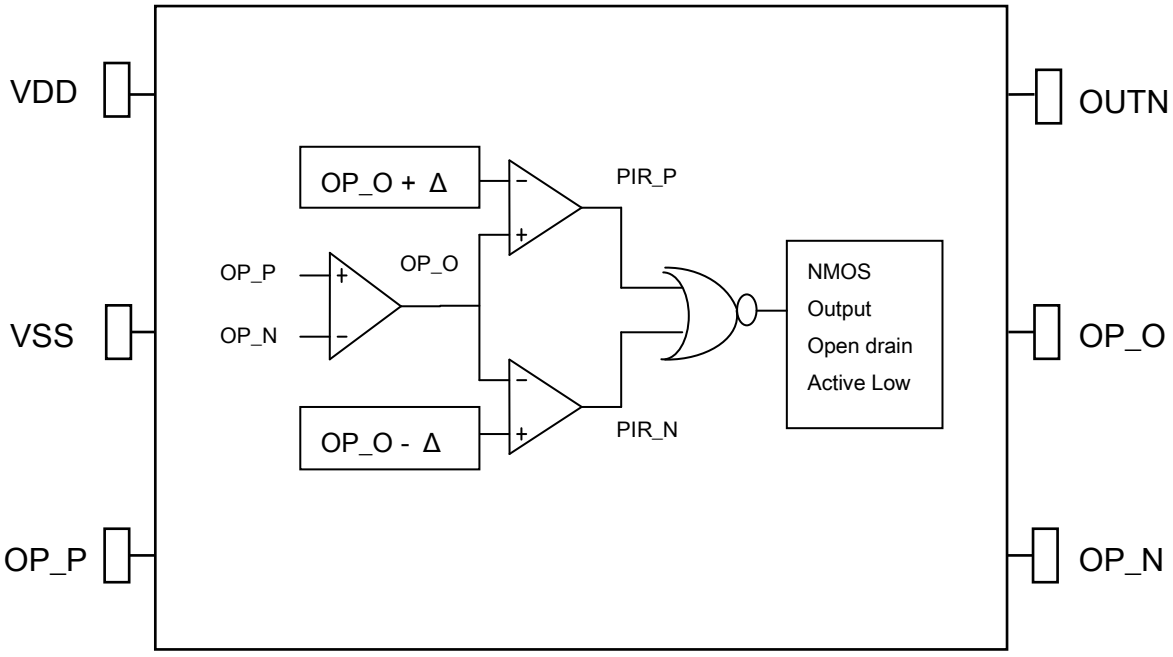
- Human body induce lamp
- Need PIR controller system

IC Package



SOT23-6

Block Diagram



***Δ : PIR variation window**

Pin Define

Pin No.	Pad Name	I/O Type	Pad Description
1	VDD	P	Positive power supply : 2.4 V ~ 5.5V
2	VSS	P	Negative power supply, ground
3	OP_P	I	OP AMP(+), input pin
4	OP_N	I	OP AMP(-), input pin
5	OP_O	O_A	OP AMP (out), output pin
6	OUTN	OD	Open Drain output(have no Diode protective circuit), active low

Pin Type

I	CMOS input
O_A	ANALOG output
OD	NMOS open drain output, have no diode protective circuit
P	Power / Ground

Electrical Characteristics

• Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Operating Temperature	T_{OP}	—	-20 ~ +70	℃
Storage Temperature	T_{STG}	—	-50 ~ +125	℃
Power Supply Voltage	V_{DD}	Ta=25°C	VSS-0.3 ~ VSS+5.5	V
Input Voltage	V_{IN}	Ta=25°C	VSS-0.3 ~ VDD+0.3	V
Note：VSS symbolizes for system ground				

• DC/AC Characteristics：(Test condition at room temperature=25℃)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD}		2.4	5.0	5.5	V
System oscillator	Fosc	Fosc=16Khz ± 15% @V_{DD}=3.3V	13.6	16.0	18.4	KHz
Warm up fast steady time	SPT	V_{DD}=3.3V	8.5	10	11.5	sec
Operating Current	I_{OP}	V_{DD}=3.3V No Load		25	35	uA
Output Port Sink Current	I_{OL}	V_{DD}=3.3V, V_{OL}=0.5V Pin : OUTN	-	25	-	mA
Output Port OP_O Current	I_{OL}	V_{DD}=3.3V, V_{OP_O}=1.5V	-	250	-	uA
	I_{OH}	V_{DD}=3.3V, V_{OP_O}=1.5V	-	250	-	uA

Function Description

1. Package Type :

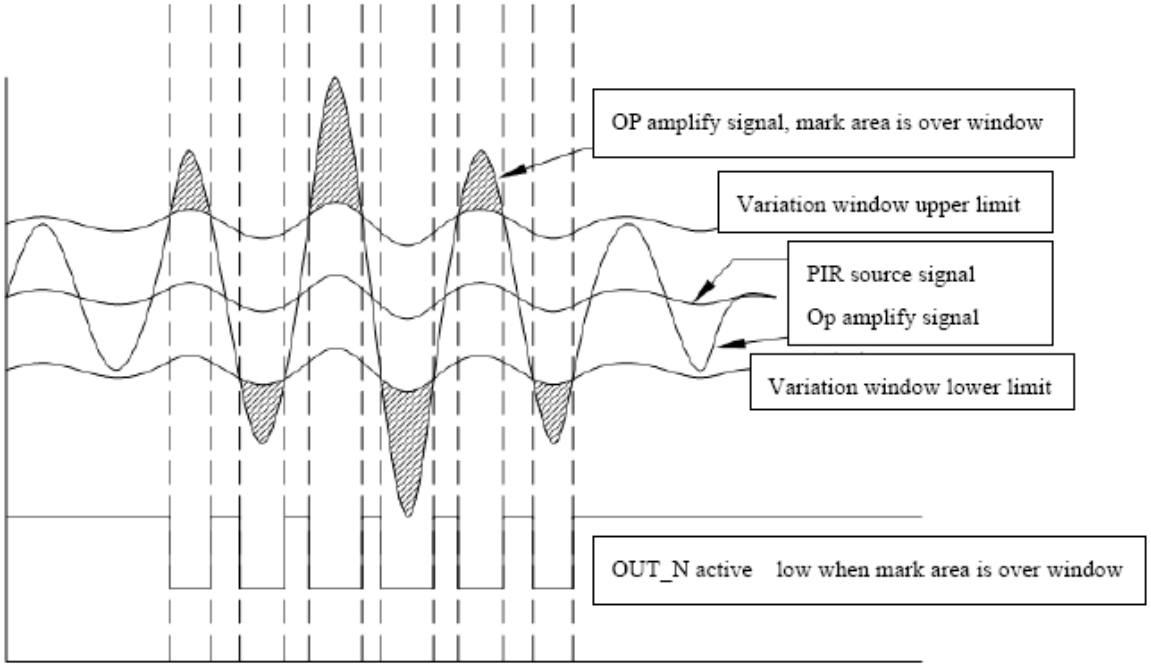
SOT23-6

2. Power ON initial

(1). Provide the first OP warm up fast steady time 10 sec after Power On。

(2). During warm up fast steady time, OUTN active low。

3. PIR signal trigger recognize

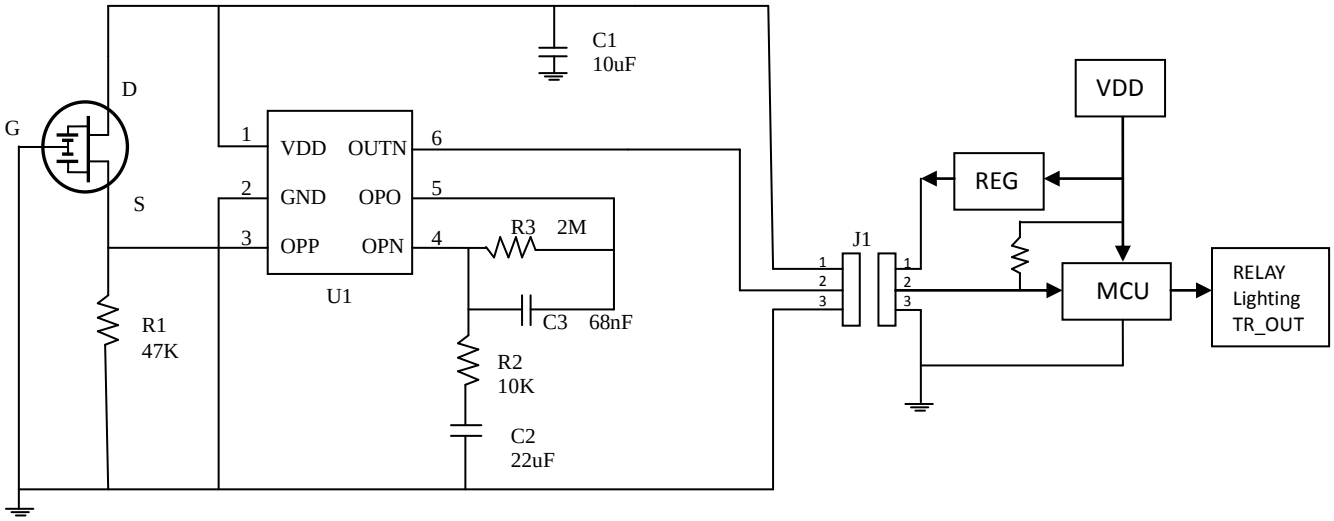


Note:

(1). If OP amplify signal is over variation window, then OUTN active low, otherwise OUTN is high impedance

(2). OUTN signal output debounce 8mS.

Application Circuit



Note:

(1).R1=47KΩ can be selected range 47KΩ ~300KΩ , if the value of R1 use higher , then PIR Sensor statics current will be smaller.

(2).R3=2MΩ don't more than 3MΩ , can be selected to adjust sensitivity, if the value of R3 use higher, then OP amplifier gain higher.

(3).R2 < 1Ω ~50KΩ can be selected to adjust sensitivity, if the value of R2 use smaller, then OP amplifier gain higher.

(4).C3=68nF~100nF has low pass filer effect, only the frequency <10Hz signal can be amplified, F=1/(2πRC)

(5).C2=10uF~47uF filter out DC signal capacitor, has high pass filer effect, only the frequency >0.1Hz signal can be amplified, F=1/(2πRC). the C2 must use ceramic capacitor that has smaller leakage current, don't use electrolytic capacitor that has higher leakage current.

(6).C1=10uF power decoupling capacitance.

(7).OP_P DC voltage=0.7V depend on PIR Sensor specification, normal range 0.4V~1.1V, suggest to use higher consistency PIR Sensor for S node voltage.

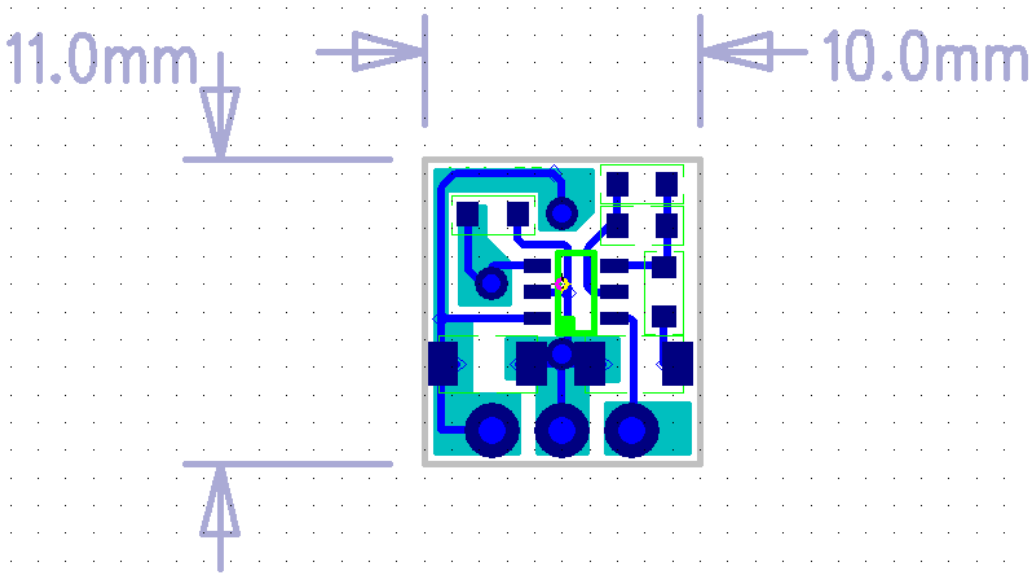
(8).If OP_O voltage is over PIR Δ variation window, then OUTN active low, otherwise OUTN is high impedance

(9).Application be requested to provide steady power, use LDO to regulate voltage 2.4V~5V, and wire is as shorter as possible

(10).OUTN is open drain output, can be connect to MCU I/O directly, **(MCU device need an internal or external pull-high resister 51KΩ ~300KΩ),** don't drive the larger current load directly, for example LED… etc.

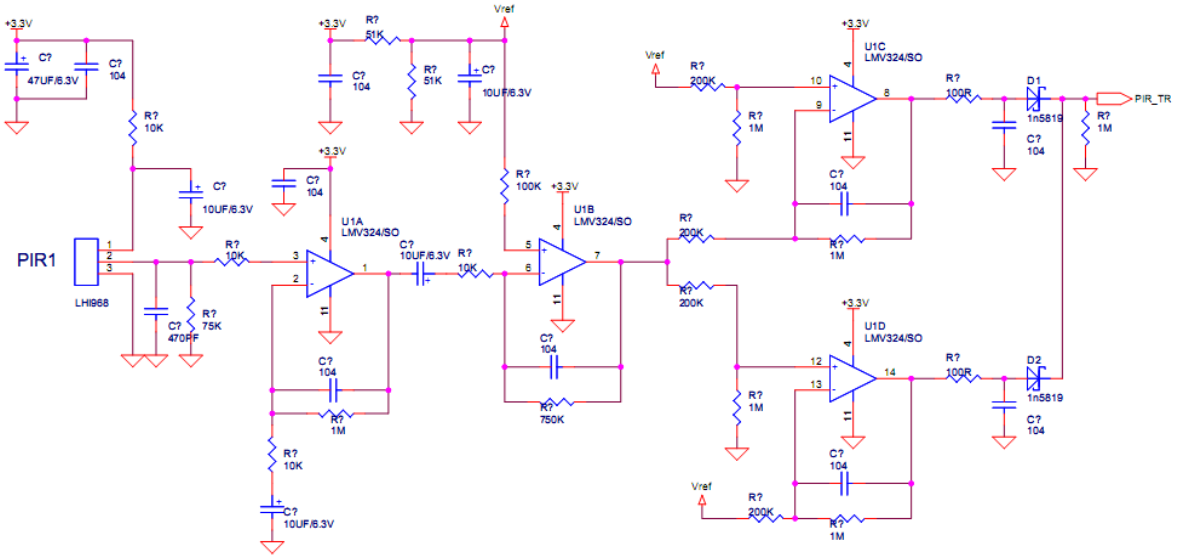
(11). OUTN signal output has debounce 8mS.

Practical Example



Contrast with LM324

The PIR signal amplification circuit which be build by LM324 has complex peripheral component. It add each component and therefore add each risk. PCB wire the more much, the more larger for noise that reduce stability of system. TTY020 amplification circuit only have 4 component for resistor and capacitor, it heavily reduce risk on application component and PCB area can be made very small size, so can avoid external interference and improve circuit working stability for long time.



Package Type

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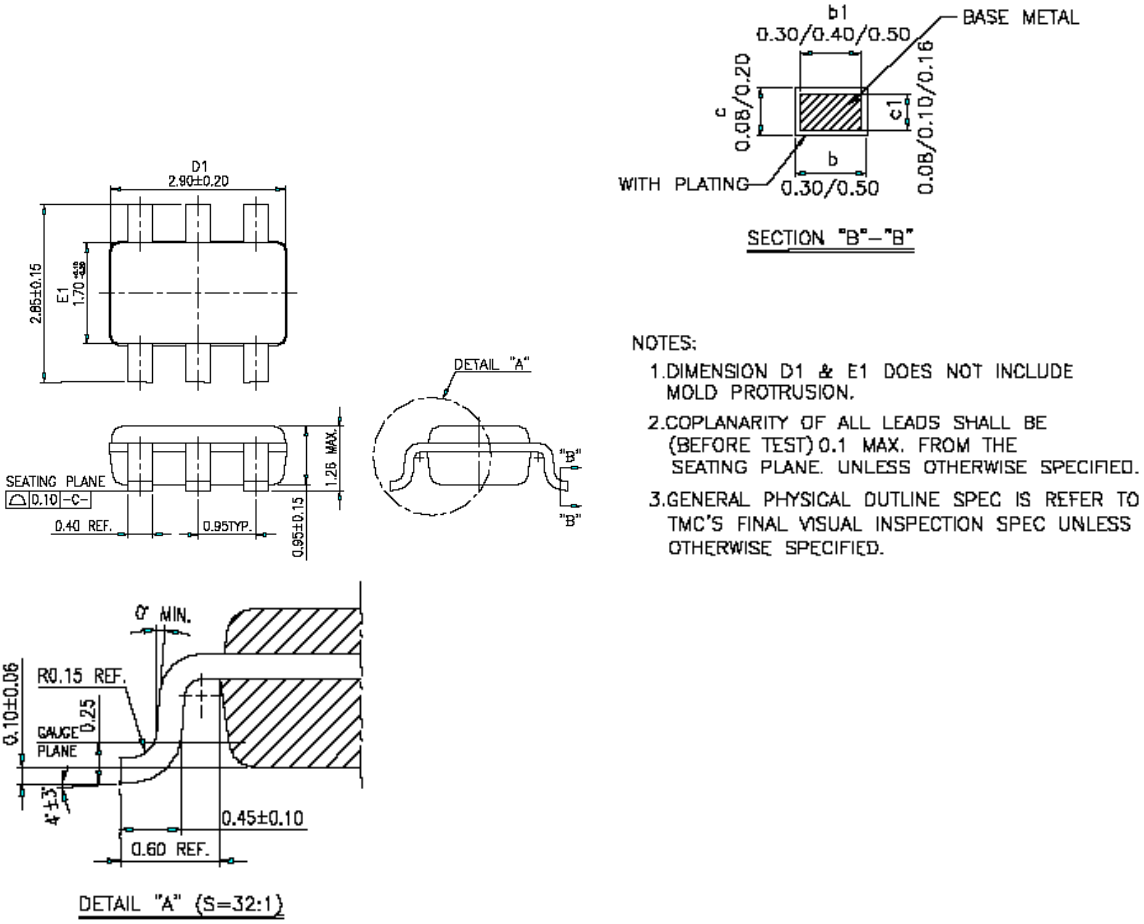

NOTES:

1. DIMENSION D1 & E1 DOES NOT INCLUDE MOLD PROTRUSION.
2. COPLANARITY OF ALL LEADS SHALL BE (BEFORE TEST) 0.1 MAX. FROM THE SEATING PLANE. UNLESS OTHERWISE SPECIFIED.
3. GENERAL PHYSICAL OUTLINE SPEC IS REFER TO TMC'S FINAL VISUAL INSPECTION SPEC UNLESS OTHERWISE SPECIFIED.

Order Information

1. Package form : TTY020-CA6
2. Chip form : __
3. Wafdebase : ---

Revise History

1. 2013/12/17 - Original version：V_1.0
2. 2014/06/10 - Modify version : V_1.1
3. 2016/01/26 - Modify version : V_1.2