



PIR CONTROLLER  
FOR DC/AC APPLICATIONS

## DESCRIPTION

The M7621 integrated circuit combines all required functions for a single chip Passive Infra Red (PIR) light controller. It is designed for load switching with a transistor or a relay in 3 wire AC and DC systems.

A conventional PIR sensor connects directly to the PIR input. The pull-down resistor and DC decoupling circuitry are integrated on chip.

The PIR signal is converted to a 15 bit digital value. External potentiometers or resistors are used to set the operating parameters for sensitivity, on-time, brightness, fade, CDS sensor and environment temperature correction. The corresponding voltage levels are converted to digital values with a 4 bit resolution all signal processing is performed digitally.

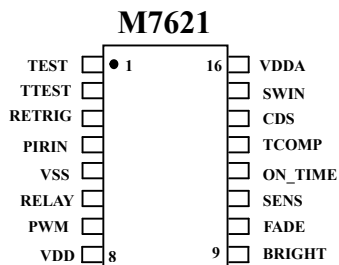
## FEATURES

- Digital signal processing
- Temperature compensation input
- Adjustment brightness.
- Adjustable PIR sensitivity
- Adjustable output turn-on time
- Retrigger / Non-retrigger function
- Dimmer function
- PWM output
- RELAY output
- SOP-16 package

## APPLICATIONS

- PIR light controller, Motion Detector, Alarm system, Auto-door bell

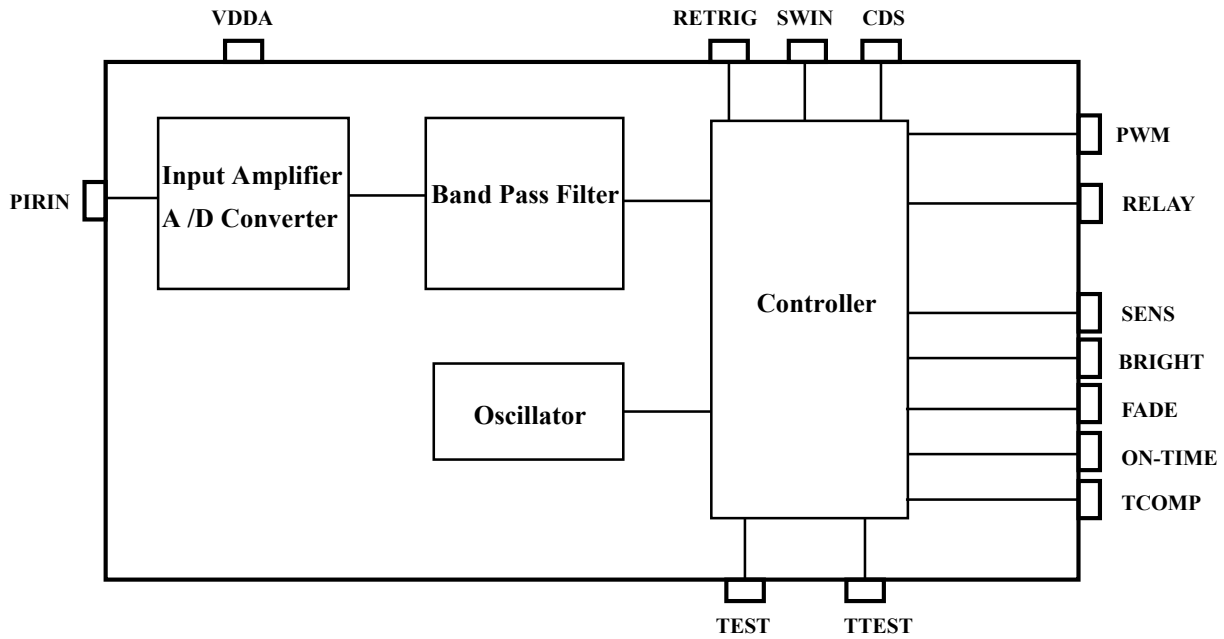
## PIN ASSIGMENT





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BLOCK DIAGRAM





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**PIN DESCRIPTION**

Pin No.	Name	I/O	Description
1	TEST	I	Reserved test mode, connect to VSS
2	TTEST	I	Reserved test mode, connect to VSS
3	RETRIG	I	Retrigger mode select input. VDD or floating : As long as movement is detected within the on-time, the light will remain on. VSS : The light will first switch off, before it can be switched on again.
4	PIRIN	I	PIR sensor input
5	VSS		Ground
6	RELAY	O	Relay output pin
7	PWM	O	Light output (PWM), external transistor
8	VDD	—	Digital VDD
9	BRIGHT	I	Brightness adjustment. Sets the maximum brightness of the light connected to the PWM output. The brightness levels are divided into 15 steps. Maximum brightness occurs at a pin voltage of $15/64 \cdot VDD$ .
10	FADE	I	Fade time adjustment ° Sets the time it takes to switch the light on or off (soft dimming). Refer to <a href="#">Table1</a>
11	SENS	I	Sensitivity threshold adjustment ° Sets the sensitivity threshold required to generate a trigger condition. Refer to <a href="#">Table1</a>
12	ON-TIME	I	Light on-time adjustment. Refer to <a href="#">Table1</a>
13	TCOMP	I	Temperature compensation input, A temperature dependent resistor network may be connected to this pin to generate voltages between $VDD \cdot 16/128$ and $VDD \cdot 31/128$ . The voltage on this pin must decrease as the temperature increases. At 37°C, the voltage should be between $VDD \cdot 19/128$ and $VDD \cdot 20/128$ . Internally. Refer to <a href="#">Table2</a> . TCOMP input may be connected to VSS if the application does not require a temperature compensation function.
14	CDS	I	Connect to the CDS voltage divider for daytime/night auto detecting VDD : Enable switching of the light VSS : Disable switching of the light
15	SWIN	I	ON-AUTO-OFF select input VDD : light permanently ON VSS : light permanently OFF Floating : PIR sensor mode (AUTO)
16	VDDA	—	PIR VDD



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**FUNCTION DESCRIPTION**

**Power-up Mode**

After the device powers on it first enters a warm-up period. The light is switched on for the selected on-time duration. The CDS input is ignored on power-up, to allow the user to verify the installation during daylight conditions.

**Trigger Condition**

The SENS threshold (refer to [Table 1](#)) is multiplied with the TCOMP factor (refer to [Table 2](#)), to obtain a temperature dependent threshold. When the filtered PIR signal exceeds this threshold, a trigger condition occurs.

**Conditions for Switching the Light ON**

If a trigger condition occurs and the CDS input is high, the light will be switched on.

The light's brightness will increase to the selected brightness within the selected fade time.

The RELAY output is activated at the start of the fading on cycle.

The light and the relay will remain on for the duration set by the ON-TIME input.

**Conditions for Switching the Light OFF**

The light is switched off softly after the selected on-time has elapsed, or if the CDS input senses a low voltage. The light's brightness will reduce to zero within the selected fade time. The RELAY output is switched off at the start of the fading-off cycle.

Pin voltage	On time	Fade time	SENS Distance
$(13/32) \times VDD \leq Vin < (15/32) \times VDD$	38.4 min	4.0 sec	
$(11/32) \times VDD \leq Vin < (13/32) \times VDD$	19.2 min	3.5 sec	
$(9/32) \times VDD \leq Vin < (11/32) \times VDD$	9.6 min	3.0 sec	
$(7/32) \times VDD \leq Vin < (9/32) \times VDD$	4.8 min	2.5 sec	
$(5/32) \times VDD \leq Vin < (7/32) \times VDD$	2.4 min	2.0 sec	
$(3/32) \times VDD \leq Vin < (5/32) \times VDD$	72 sec	1.5 sec	
$(1/32) \times VDD \leq Vin < (3/32) \times VDD$	36 sec	1.0 sec	
$0 \leq Vin < (1/32) \times VDD$	9 sec	0.5 sec	

**Table 1 : On-time and Fade-time**

Pin voltage	TCOMP factor	Pin voltage	TCOMP factor
$< (16/128) \times VDD$	7/8	$(24/128) \times VDD$	8/8
$(17/128) \times VDD$	6/8	$(25/128) \times VDD$	9/8
$(18/128) \times VDD$	5/8	$(26/128) \times VDD$	10/8
$(19/128) \times VDD$	4/8	$(27/128) \times VDD$	11/8
$(20/128) \times VDD$	4/8	$(28/128) \times VDD$	12/8
$(21/128) \times VDD$	5/8	$(29/128) \times VDD$	13/8
$(22/128) \times VDD$	6/8	$(30/128) \times VDD$	14/8
$(23/128) \times VDD$	7/8	$> (31/128) \times VDD$	15/8

**Table 2 : Temperature compensation factor**

**Note :** At 37°C, the voltage should be between  $VDD \times 19/128$  and  $VDD \times 20/128$ .



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**ABSOLUTE MAXIMUM RATING**

(TA = 25°C)

Parameter	Sym.	Min.	Max.	Unit	Remarks
Supply Voltage	VDD	-0.3	5	V	
Current On Any Pin		-100	100	mA	
Operating Temperature		-25	70	°C	
Storage temperature	Tst	-45	125	°C	

**ELECTRICAL CHARACTERISTICS**

(TA=25°C , VDD=4.4V)

Characteristics	Sym.	Min.	Typ.	Max.	Unit	Conditions
<b>Operating Voltage</b>						
Supply voltage	VDD	3.3	4.4	5.0	V	
Supply current	IDD	—	—	200	μA	VDD=4.4V (outputs unloaded)
<b>Oscillator and Filter</b>						
LPF cutoff frequency		—	5	—	Hz	
HPF cutoff frequency		—	0.3	—	Hz	
Clock frequency	F <sub>CLK</sub>	—	64	—	KHz	
<b>Analog Inputs</b>						
Input leakage current (ON-TIME、SENS、FADE、BRIGHT、TCOMP)		-1	—	1	μA	
PIRIN resistance to VSS		—	70	—	KΩ	
PIRIN input AC voltage		—	—	50	mV	Peak-to-Peak
PIRIN input DC voltage		0.2	—	1.5	V	
<b>Digital Inputs, Schmitt Triggers ( TEST、TTEST、RETRIG、CDS )</b>						
Input low voltage	V <sub>IL</sub>	80	—	—	%VDD	
Input high voltage	V <sub>IH</sub>	—	—	20	%VDD	
Pull down current on TEST, TTEST		—	140	—	μA	input to VDD
Pull up current on RETRIG		—	70	—	μA	input to VSS
Leakage current on CDS		—	—	±1	μA	input to VSS or VDD
<b>Digital Outputs ( PWM、RELAY )</b>						
PWM Output low voltage	V <sub>OL</sub>	—	—	10	%VDD	I <sub>SOURCE</sub> = 5mA
PWM Output high voltage	V <sub>OH</sub>	90	—	—	%VDD	I <sub>SINK</sub> = 2mA
Relay Source Current	I <sub>RS</sub>	—	—	10	mA	

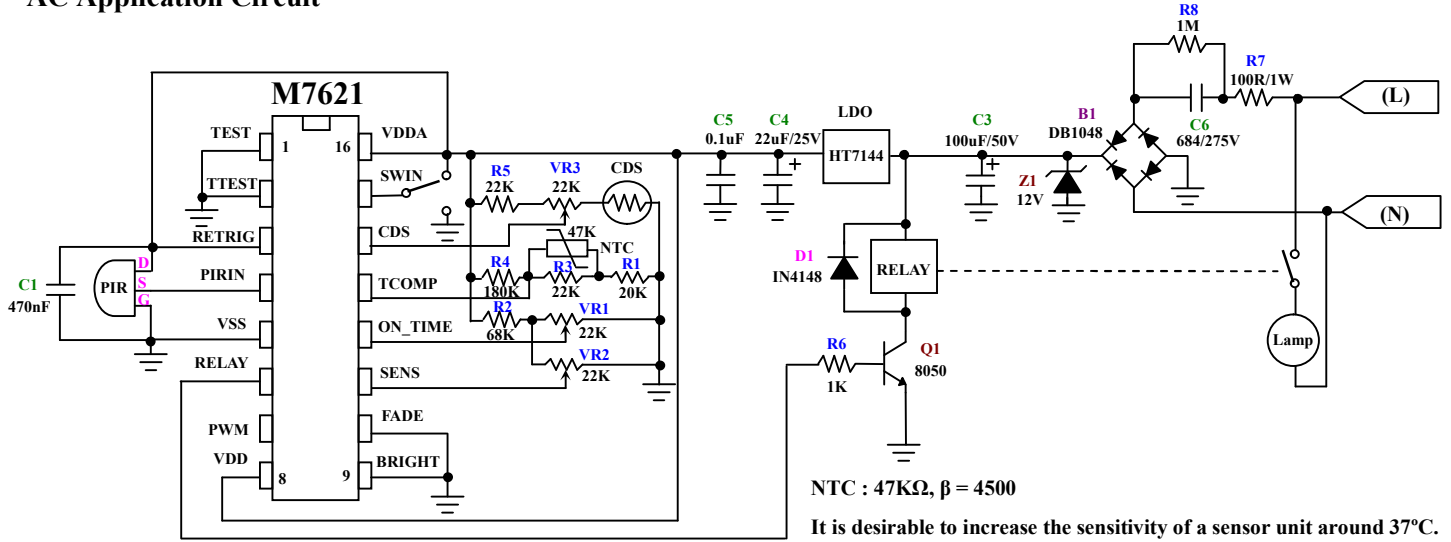


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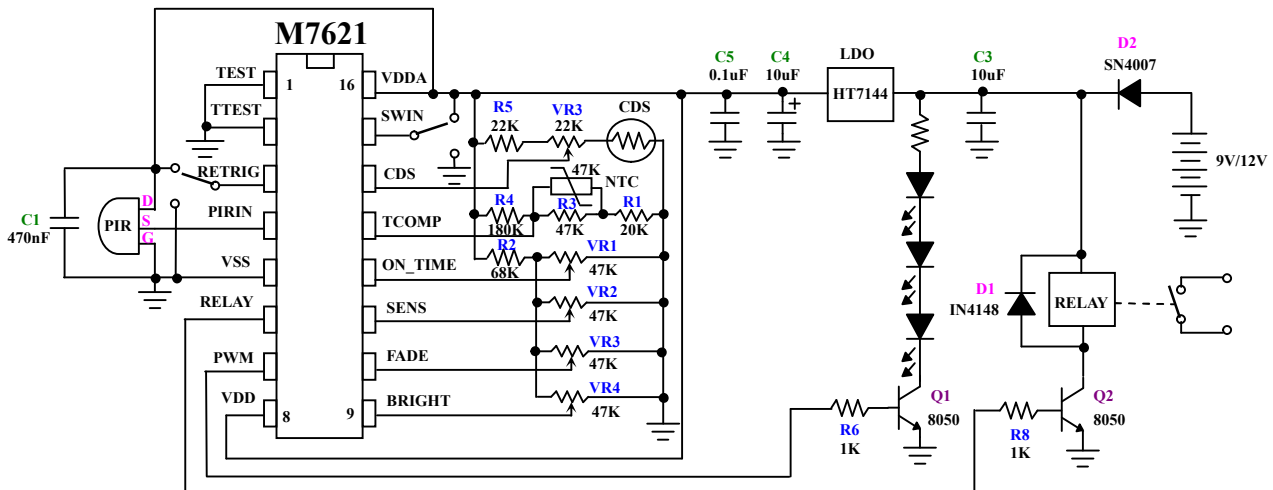
APPLICATION CIRCUIT

AC Application Circuit



RETRIG = VDD : Retrigger  
= VSS : Non-Retrigger

DC Application Circuit



RETRIG = VDD : Retrigger  
= VSS : Non-Retrigger

\* All specs and applications shown above subject to change without prior notice.



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**PACKAGE OUTLINE**

