PIR CONTROLLER
FOR RELAY OR TRIAC APPLICATION

DESCRIPTION

The M7622 integrated circuit combines all required functions for a single chip Passive Infra-Red (PIR) light controller. It is designed for load switching with a TRIAC in 2 wire and 3 wire systems.

External potentiometers or resistors are used to set the operating parameters for sensitivity, on-time, brightness, fade, daylight 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.

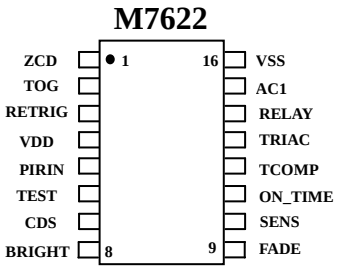
FEATURES

- Digital signal processing
- On chip rectifier and supply regulator
- Temperature compensation input
- Adjustable soft on/off switching (fading)
- Light mode：Increase lamp brightness from set brightness to full brightness on movement.
- Light mode：Increase lamp brightness from off to set brightness on movement.
- Dimmer function
- Inductive load switching
- Drive either RELAY or TRIAC
- Suitable for 115V/60Hz and 230V/50Hz applications
- SOP-16 package

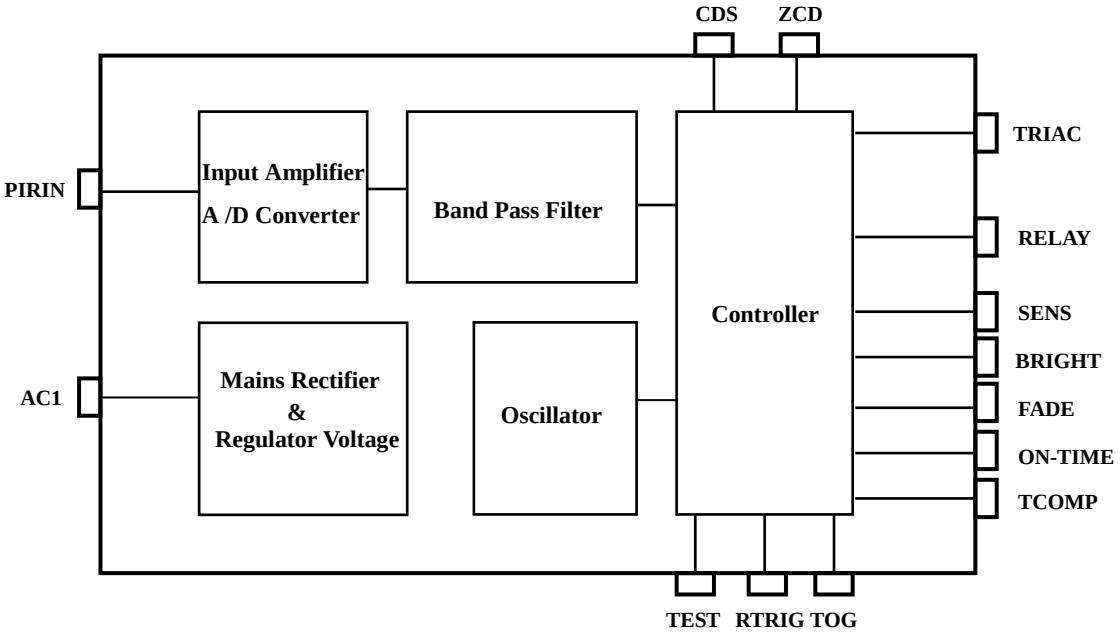
APPLICATIONS

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

PIN ASSIGMENT



BLOCK DIAGRAM



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PIN DESCRIPTION

Pin No.	Name	I/O	Description
1	ZCD	I	Input pin for AC zero crossing detecting
2	TOG	I	Toggle mode OTSB and STFB mode select. If enabled a mains On – Off - On will switch the load permanently to set brightness if DARK. VDD *3/16 or greater：OTSB mode, mains toggling enabled. VDD *5/32：STFB mode, mains toggling enabled. VDD *3/32：STFB mode, mains toggling disabled VDD *1/16 or less：OTSB mode, mains toggling enabled
3	RETRIG	I	Retrigger mode select VDD or floating：The timer for the on-time is restarted whenever movement is detected. VSS：The light will stay on for the on-time. Movement detection is ignored during this period.
4	VDD	—	Digital VDD
5	PIRIN	I	PIR sensor input
6	TEST	I	Reserved , Test mode , connect to VSS
7	CDS	I	Dark mode input, connected to CDS/Photodiode VDD：Enable switching of the light VSS：Disables switching of the light Do not leave this input floating
8	BRIGHT	I	Brightness adjustment; The brightness levels are divided into 15 equal steps. One step corresponds to 90*(1- 1/16) degrees phase angle.
9	FADE	I	Fade time adjustment。On and off fading takes equally long. Refer to **Table 1**
10	SENS	I	Sensitivity threshold adjustment。With 8 steps different threshold values are possible. Refer to **Table 1**
11	ON-TIME	I	Light on-time adjustment. Refer to **Table 1**
12	TCOMP	I	Temperature compensation input, A temperature dependent resistor network may be connected to this pin to generate voltages between VDD*16/128 and VDD*31/128. The voltage on this pin must decrease as the temperature increases. At 37℃, the voltage should be between VDD*19/128 and VDD*20/128. Internally. Refer to **Table2**. TCOMP input may be connected to VSS if the application does not require a temperature compensation function.
13	TRIAC	O	TRIAC gate signal , push-pull
14	RELAY	O	RELAY output, push-pull The RELAY output is an active high output and changes state at the start of the fading cycle
15	AC1	I	Mains power input
16	VSS	—	Ground

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 threshold voltage (SENS) is multiplied with the TCOMP factor (refer to **Table 1**), to obtain a temperature dependent threshold voltage (refer to **Table 2**). When the PIR signal exceeds this calculated threshold voltage, a trigger condition occurs.

Conditions for Switching the Light ON (OTSB mode)

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 relay will remain on and the light at the set BRIGHTNESS for the duration set by the ON-TIME input. The CDS input is ignored during this time.
If the TOGGLE MODE is enabled, the light can also be switched on by toggling the mains ON-OFF-ON within 3 seconds. In this mode, the PIR input is ignored; the CDS input will switch the light ON or OFF. This mode is disabled by disconnecting the mains for a few seconds.

Conditions for Switching the Light OFF (OTSB mode)

The light fades to zero after the selected ON-TIME has elapsed, within the selected FADE TIME.
The RELAY output is switched off at the start of the fading-off cycle.

Conditions for Switching the Light ON (STFB mode)

If the DARK input is high, the light will be on at the set BRIGHTNESS. If a trigger condition occurs, the light will be switched to full brightness. The light's brightness will increase to maximum within the selected FADE TIME.
The RELAY output is activated at the start of the fading-on cycle.
The relay output will be active and the light remains at full brightness for the duration set by the ON-TIME input.
If the TOGGLE MODE is enabled, the light can also be switched on to the set brightness by toggling the mains ON-OFF-ON within 3 seconds. In this mode, the PIR input is ignored; the CDS input will switch the light ON or OFF. This mode is disabled by disconnecting the mains for a few seconds.
The RELAY output is switched off at the start of the fading-off cycle.

Condition for Switching the Light to set brightness (STFB mode)

The light will fade within the selected FADE TIME to the set BRIGHTNESS after the selected ON-TIME has elapsed.

Pin voltage	On time	Fade time (50Hz)	Fade time (60Hz)	SENS distance
(13/64) xVDD ≤Vin＜(15/64) xVDD	78 min	4.5 sec	3.7 sec	Near distance
(11/64) xVDD ≤Vin＜(13/64) xVDD	39 min	3.8 sec	3.2 sec	
(9/64)xVDD ≤Vin＜(11/64) xVDD	20 min	3.2 sec	2.7 sec	
(7/64)xVDD ≤Vin＜(9/64)xVDD	10 min	2.6 sec	2.1 sec	
(5/64)xVDD ≤Vin＜(7/64)xVDD	5 min	1.9 sec	1.6 sec	
(3/64)xVDD ≤Vin＜(5/64)xVDD	2.5 min	1.3 sec	1.1 sec	
(1/64)xVDD ≤Vin＜(3/64)xVDD	37 sec	0.6 sec	0.5 sec	
0 ≤Vin＜(1/64)xVDD	9.2 sec	0 sec	0 sec	Long distance

Table1：Parameter and operational settings related to pin voltage

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

Table 2：Temperature compensation factor

Note: At 37℃, the voltage should be between VDD*19/128 and VDD*20/128.

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ABSOLUTE MAXIMUM RATING (TA=25℃)

Parameter	Sym.	Min.	Max.	Unit	Remarks
Supply Voltage	VDD	-0.3	7	V	
Current On Any Pin		-100	100	mA	
Operating Temperature		-25	70	℃	
Storage temperature	Tst	-45	125	℃	

ELECTRICAL CHARACTERISTICS (TA=25℃, VDD=4V)

Characteristics	Sym.	Min.	Typ.	Max.	Unit	Conditions
Rectifier / Regulator						
AC1, input current, t < 200us		—	500	—	mA	Repetitive @60Hz
Regulated supply voltage	VDD	3.6	—	4.5	V	
Supply current	IDD	—	—	0.3	mA	VDD=4.5V Outputs unloaded
Oscillator and Filter						
LPF cutoff frequency		—	7	—	Hz	
HPF cutoff frequency		—	0.5	—	Hz	
Clock frequency	F_{CLK}	—	64	—	KHz	
Analog Inputs						
Input leakage current (ON-TIME, SENS,FADE, BRIGHT, TCOMP, TOG)		-1	—	1	μA	
PIRIN resistance to VSS		—	60	—	KΩ	
PIRIN input AC voltage		—	—	5	mV	Peak-to-Peak
PIRIN input DC voltage		0	—	VDD	V	
Digital Inputs, Schmitt Triggers (TEST, RETRIG, CDS)						
Input low voltage	V_{IL}	80	—	—	%VDD	
Input high voltage	V_{IH}	—	—	20	%VDD	
Pull down current on TEST		—	140	—	μA	Input to VDD
Pull up current on RETRIG		—	140	—	μA	Input to VSS
Leakage current on CDS		—	—	±1	μA	Input to VSS or VDD
Pull up / Pull down scanning current on SWIN		—	—	6	mA	Input to VSS or VDD
Digital Outputs (TRIAC, RELAY)						
Output low voltage	V_{OL}	—	—	10	%VDD	I_{SOURCE} = 5mA
Output high voltage	V_{OH}	90	—	—	%VDD	I_{SINK} = 2mA

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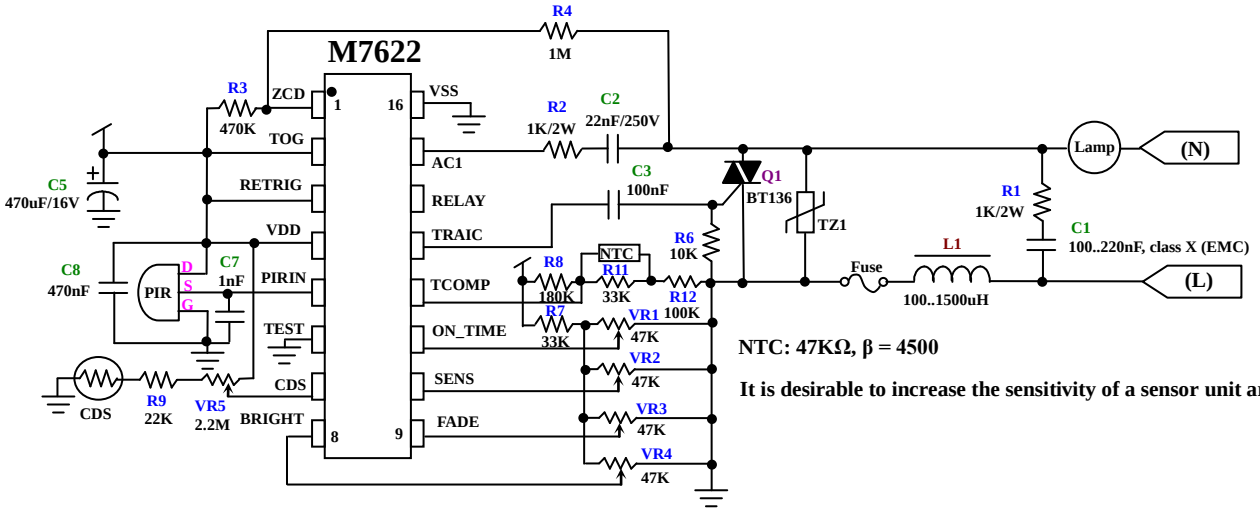
APPLICATION CIRCUIT

TRIAC Application Circuit (2 Wire)



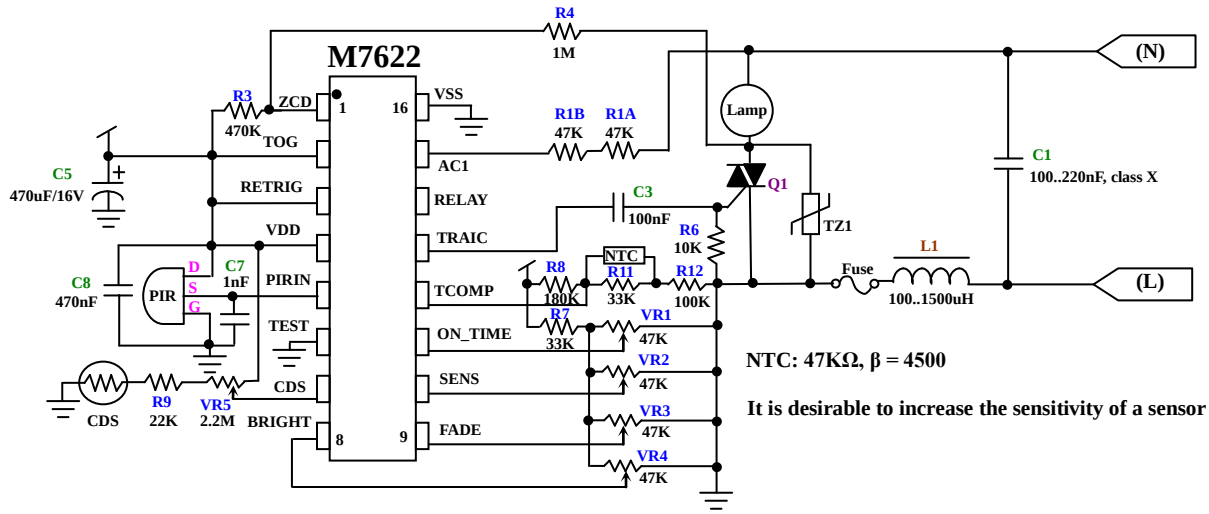
NTC: 47KΩ, β = 4500

It is desirable to increase the sensitivity of a sensor unit around 37℃.

RETRIG = VDD：Retrigger

= VSS：Non-Retrigger

TRIAC Application Circuit (3 Wire)



NTC: 47KΩ, β = 4500

It is desirable to increase the sensitivity of a sensor unit around 37℃.

RETRIG = VDD：Retrigger

= VSS：Non-Retrigger

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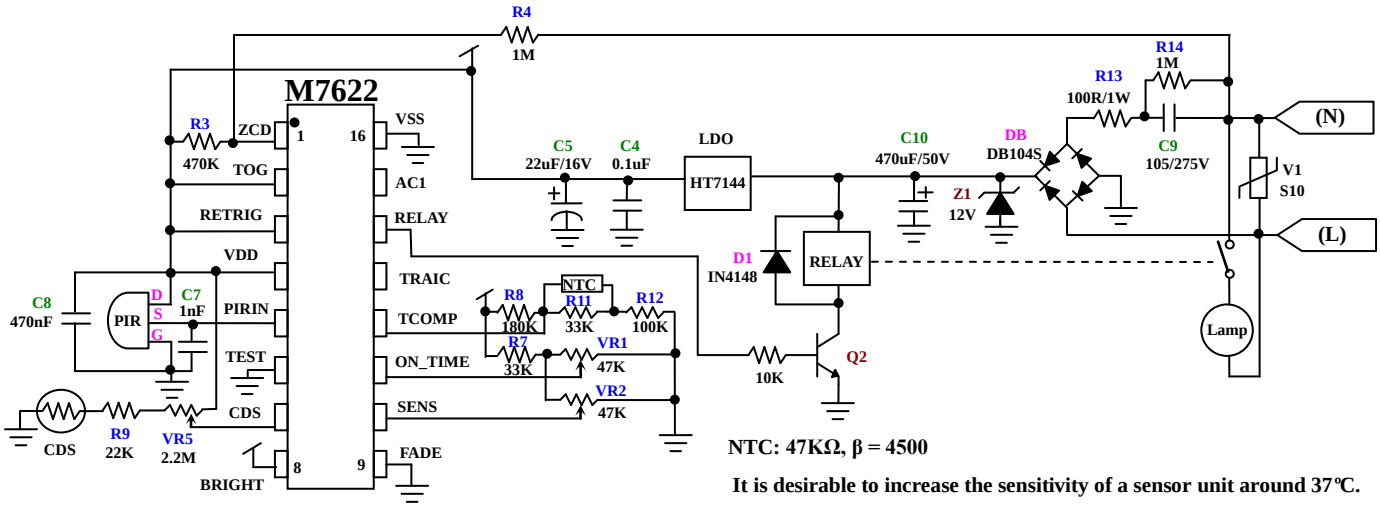
RELAY Application Circuit



NTC: 47KΩ, β = 4500

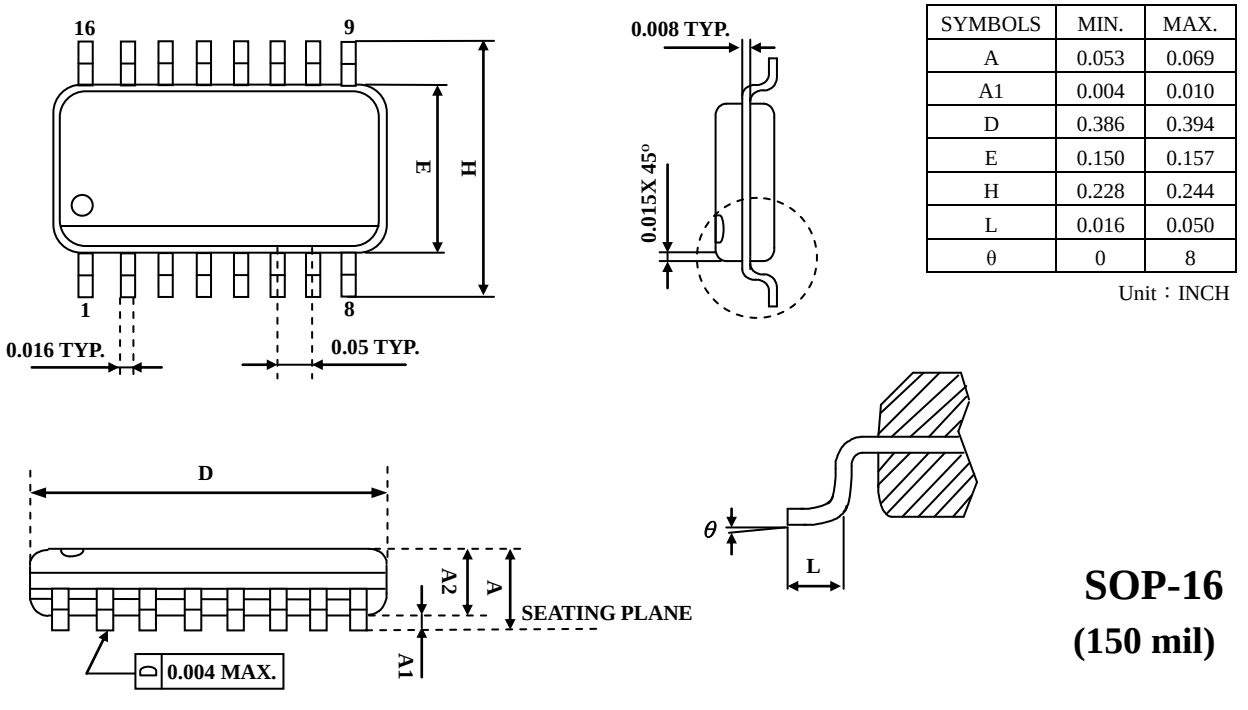
It is desirable to increase the sensitivity of a sensor unit around 37℃.

RETRIG = VDD：Retrigger

= VSS：Non-Retrigger

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

PACKAGE OUTLINE



SYMBOLS	MIN.	MAX.
A	0.053	0.069
A1	0.004	0.010
D	0.386	0.394
E	0.150	0.157
H	0.228	0.244
L	0.016	0.050
θ	0	8

Unit：INCH

SOP-16
(150 mil)