

HI-2410, 17

Capacitive Touch Light Dimmer Circuits

General Description

The HI-2410 is a second generation CMOS integrated circuit designed to control the brightness of incandescent lamps. When a touch is applied to the input plate, which is the exterior metal of the lamp fixture, the output steps to the next brightness level. A companion chip, the HI-2417, is also available. It is identical to the HI-2410 except that it has one less brightness level. An internal power-on reset sets the level to OFF when the system is turned on.

BRIGHTNESS	SEQUENCE
HI - 2410	HI - 2417
OFF	OFF
NIGHT LIGHT	NIGHT LIGHT
MOOD LIGHT	MEDIUM
MEDIUM	HIGH
HIGH	OFF
OFF	

The brightness levels are established by delaying the OUT pulse from the detected zero crossing of the AC line signal. These delays are:

BRIGHTNESS	NOMINAL DELAY
NIGHT LIGHT	6.0ms
MOOD LIGHT	4.6ms
MEDIUM	3.1ms
HIGH	0.6ms

Other touch-input ICs are designed for a specific capacitive load. Since the metal surface area of the lamp fixture determines capacitive load, they are limited to use in lamps of a specific size. The touch input of the HI-2410 has automatic gain control which automatically compensates for long-term capacitive load. Thus, it is equally useful for fixtures varying in size from small desk lamps to large floor models.

The design will tolerate component value variation while maintaining fast touch response with high noise immunity.

PRELIMINARY

Features

- Replaces Mechanical Switches
- Saves Power in Incandescent Lamps
- CMOS Technology provides for Low Power Consumption and High Noise Immunity in the Control Circuit
- Can Be Used in a Large Range of Lamp Fixture Sizes
- Lower Cost of External Components
- Fast Touch Response with No Skipping
- Designed to Reject AC Line Noise, therefore Eliminating False Triggers

Pin Description

- Pin 1 - SEN - Sensitivity RC - The resistor to VDD and capacitor to VSS at this pin establish the time delay from a touch input to a brightness change.
- Pin 2 - INT - Intensity Adjust - Sets the timing delay for the Triac Gate at the night light level. All the other levels are proportional to this delay.
- Pin 3 - VSS - This is the ground reference for the system and is tied to AC Hot.
- Pin 4 - TRG - Triac Gate - Provides a pulse to the Triac Gate which turns the AC power on across the lamp. The zero crossing turns the Triac off.
- Pin 5 - ADJ - AGC Adjust - Adjusts the time constant of the Automatic Gain Control loop. The value of capacitor selected will affect noise immunity and lamp load compensation.
- Pin 6 - TCH - Touch Input - Input for sensing a touch plate and thereby sequencing brightness levels.
- Pin 7 - VDD - Nominally +10V DC - An internal zener and regulator established voltage.
- Pin 8 - REF - Timing Reference - AC timing input for detection of zero crossing.

Pin Assignment

SEN	1	8	REF
INT	2	7	VDD
VSS	3	6	TCH
TRG	4	5	ADJ

(Top View)

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Absolute Maximum Ratings

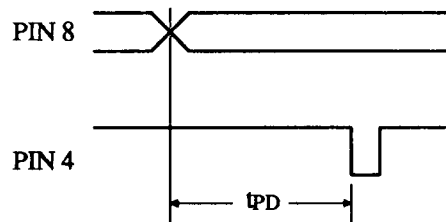
SYMBOL	PARAMETER	VALUE	UNITS
V_{IN}	ANY INPUT VOLTAGE	$V_{DD} + 0.3$ $V_{SS} - 0.3$	V
T_A	OPERATING TEMPERATURE	0 TO +80	°C
T_{stg}	STORAGE TEMPERATURE	-60 TO +150	°C

NOTE: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

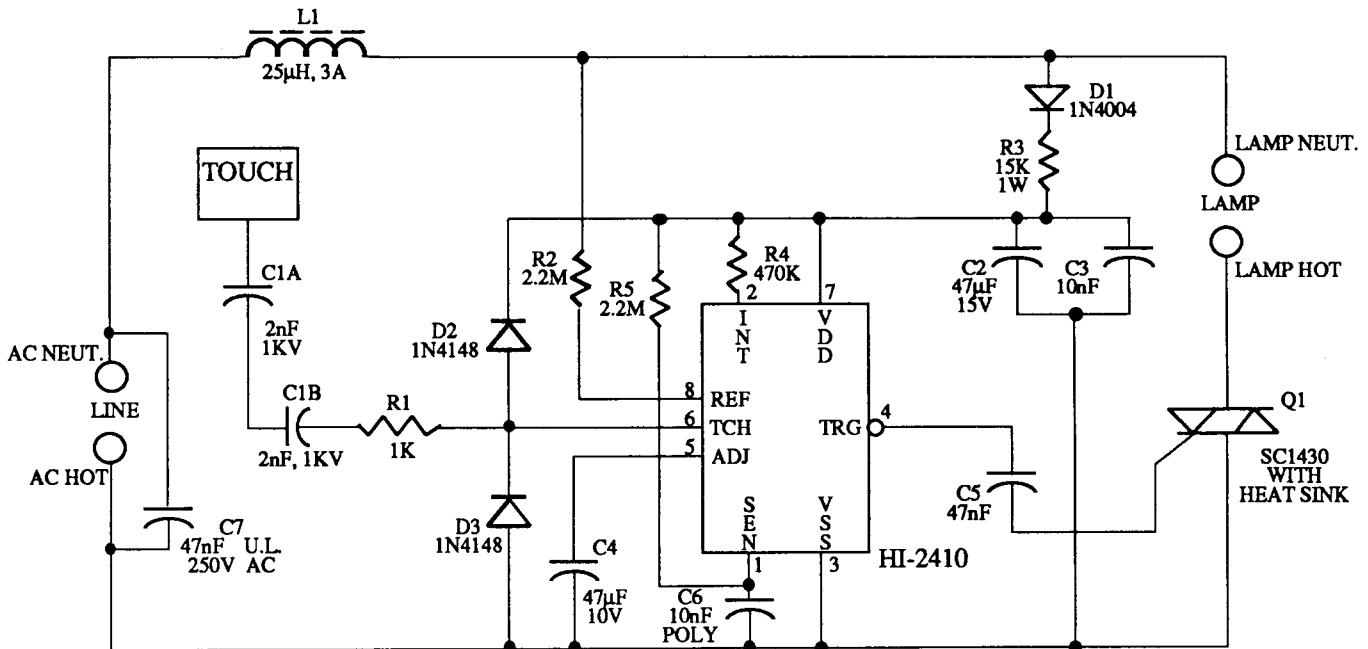
Functionality

Examine Pin 4 for presence of output pulses. Step to each state by providing a touch to the touch plate.

STATE	t_{PD}		
	MIN	TYP	MAX
OFF	Achieved by POR		
1	5.4ms	6.0ms	6.8ms
2	4.1ms	4.6ms	5.4ms
3	2.8ms	3.1ms	3.8ms
4	0.4ms	0.6ms	0.8ms
OFF			



Application Diagram



Frequency And Timing Characteristics

FREQ = 60Hz at 25 °C

V_{DD} = 9.5V and V_{SS} = 0V (Unless Otherwise Stated)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
PW TRG	PULSE WIDTH		100	240	350	μs
FREQ TCH	FREQUENCY	PIN 5 = 0V MEASURE VOLTAGE ON 1K LOAD TO 0V	150	200	250	KHz

DC Electrical Characteristics

V_{DD} = 9.5V and V_{SS} = 0V at 25 °C (Unless Otherwise Stated)

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V _{DD}	REGULATED VOLTAGE	12V SUPPLIED THROUGH 330Ω	9.6	10.3	10.6	V
I _{DD}	CURRENT DRAIN	SEE NOTE 1	–	700	900	μA
I _O SEN	SINK CURRENT SOURCE CURRENT	500K TO V _{DD} AT PIN 2; V _{IN} = 9.5V V _{IN} = 0V	15 –	25 –	40 0.1	μA μA
I _O INT	SINK CURRENT SOURCE CURRENT	V _{IN} = 3.0V OPEN	20 –	33 –	45 0.1	μA μA
I _O TRG	SINK CURRENT SOURCE CURRENT	MEASURE VOLTAGE ON 1K LOAD TO V _{DD} V _{OUT} = 0V	0.2 0.1	0.3 0.3	– 0.5	V mA
I _O ADJ	SINK CURRENT SOURCE CURRENT	V _{OUT} = V _{DD} V _{OUT} = 0V	100 100	200 150	300 300	μA μA
I _O TCH	SINK CURRENT SOURCE CURRENT	PIN 5 = 3.0V PIN 6 = 9.5V PIN 5 = 0V MEASURE VOLTAGE ON 1K LOAD TO 0V	0.8 5.0	1.5 5.8	2.2 6.5	mA V
I _O REF	SINK CURRENT SOURCE CURRENT	V _{IN} = 9.5V V _{IN} = 0V	150 –	250 –	400 0.1	μA μA

Note 1:

The V_{DD} Pin is a regulator which acts like a zener diode. The current drain is specified below the zener voltage and thus represents the DC current which the chip itself consumes.

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