HT7704
Touch Dimmer

Feature

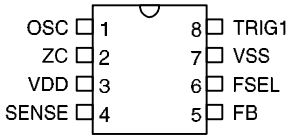
- Operating voltage: 4~10V
- High noise immunity CMOS technology
- High sensitivity and stability
- Polarity insensitive with AC line
- Minimal external components required
- Loading range of sense input from 0 to 1000pf
- 50/60 Hz selectable
- HT7704A: 3 steps control
  HT7704B: 4 steps control
  HT7704C: On/off switch
- 8 pin DIP/SOP package

General Description

The HT7704 series are CMOS LSIs in 8-lead DIP package. They are designed to control the brightness of an incandescent lamp by changing the triggering angles of the TRIAC with touch sense input.

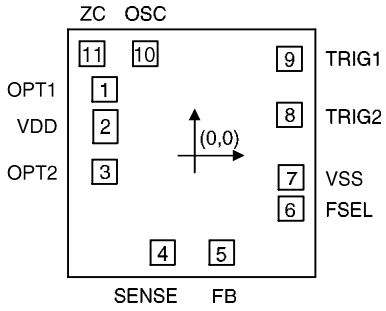
HT7704 is a selectable 3-step, 4-step or on/off switch function dimmer. High sensitivity and stability account for its eminent performance. The sense input can sustain very heavy capacitive loading and propagate sense through a highly resistive line. In addition, the application circuit is very simple.

Pin Assignment



HT7704A/B/C
– 8 DIP/SOP

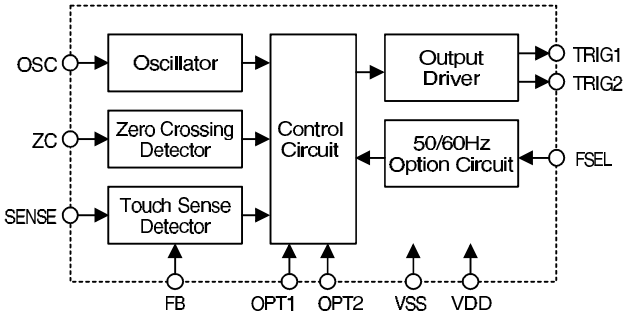
Pad Assignment



Chip size: $1640 \times 1620\ (\mu m)^2$

* The IC substrate should be connected to VSS in the PCB layout artwork.

Block Diagram



Pad Coordinates

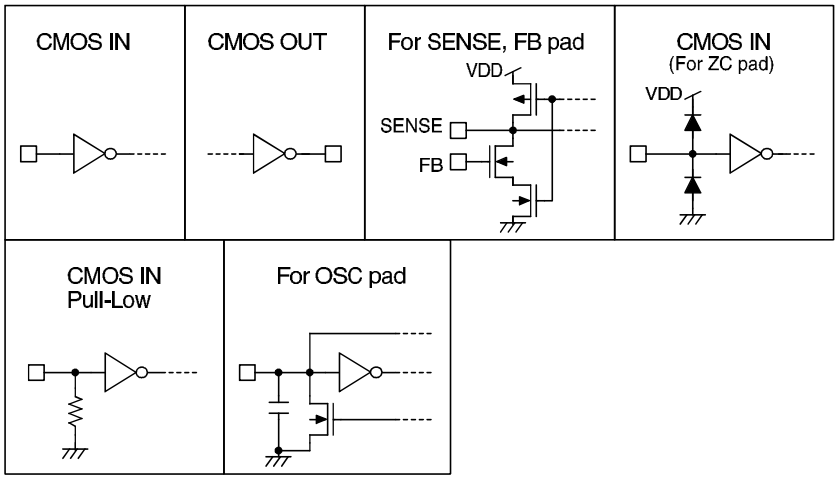
Unit: μm

Pad No.	X	Y	Pad No.	X	Y
1	–563.75	373	7	604.75	–122
2	–557.25	166	8	594.25	230.5
3	–563.75	–91	9	595.25	544.5
4	–198.25	–544	10	–308.25	573.5
5	171.25	–544	11	–641.75	573.5
6	604.75	–297			

Pin Description

Pin No.	Pin Name	I/O	Internal Connection	Description
1	OSC	I	*	Oscillator input
2	ZC	I	CMOS	Line frequency 50Hz or 60Hz input for zero crossing
3	VDD	I	—	Power supply (positive)
4	SENSE	I	*	Touch sense input
5	FB	I	*	Feedback signal to control the sink current of the SENSE pin.
6	FSEL	I	CMOS	For 50Hz or 60Hz AC signal selection input It is connected to VSS when the AC line is 50Hz. However, when the AC line is 60Hz, it is connected to VDD. Refer to the application circuit for connection details.
7	VSS	I	—	Power supply (negative)
8	TRIG1	O	CMOS	Trigger output to drive the TRIAC Low pulse output with a capacitor and resistors for applications

Approximate internal connection circuit



Absolute Maximum Ratings

Supply Voltage ..... –0.3V to 12V
Input Voltage..... V_{SS}–0.3V to V_{DD}+0.3V
Operating Temperature..... 0°C to 70°C
Storage Temperature..... –50°C to 125°C

Electrical Characteristics

(Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Type	Max.	Unit
		V_{DD}	Condition				
V_{DD}	Operating Voltage	—	—	4	7	10	V
I_{DD}	Operating Current	7V	*	—	200	400	μA
I_{IH}	OPT1, OPT2 Input High Current	7V	V_{IH}=7V	—	40	80	μA
I_{OL1}	TRIG1 Sink Current	7V	V_{OL}=0.7V	0.4	0.7	—	mA
I_{OH1}	TRIG1 Drive Current	7V	V_{OH}=6.3V	–8	–14	—	mA
I_{OL2}	TRIG2 Sink Current	7V	V_{OL}=0.7V	6	11	—	mA
I_{OH2}	TRIG2 Drive Current	7V	V_{OH}=6.3V	–1	–2	—	mA
V_{IH}	Input High Voltage	—	—	$0.8V_{DD}$	—	—	V
V_{IL}	Input Low Voltage	—	—	—	—	$0.2V_{DD}$	V
F_{OSC}	Operating Frequency	7V	R_{OSC}=150KΩ	—	400	—	KHz

* The test conditions are shown below:

a. ZC is supplied by 60Hz/7V sinwave via 100KΩ.

b. FB is connected to VSS and SENSE, FSEL to VDD.

Functional Description

Selection table

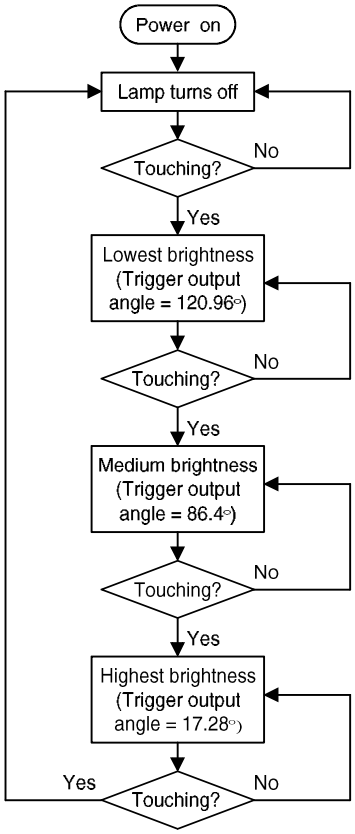
There are 3 types of HT7704 and the following table illustrates their operating mode:

IC No.	OPT1	OPT2	Function
HT7704A	Open	Open	3 steps of controllable brightness
HT7704B	Open	Bond to VDD	4 steps of controllable brightness
HT7704C	Bond to VDD	Open	On/off the light

Flow Chart

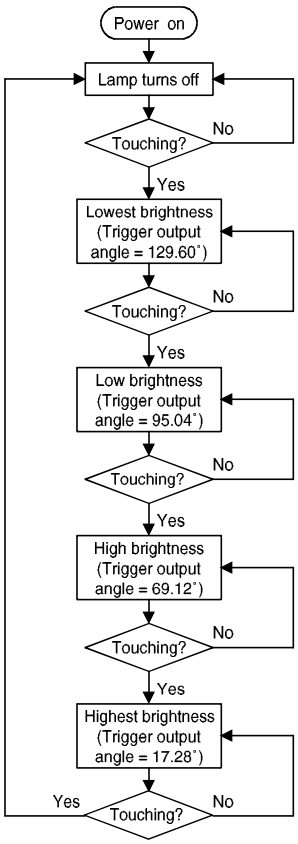
- 3 steps (for the HT7704A)

  The first touch turns the light on at it's initial brightness level. The second touch makes the light a little brighter. The light is the brightest by the third touch. Finally, the fourth touch turns the light off.



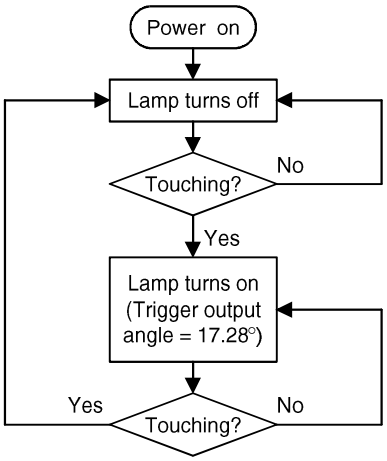
- 4 steps (for the HT7704B)

  Similarly with the 4-step. The first touch tuns the light on at it's initial brightness level. The second touch makes the light brighter. The brightness increases greatly on the third touch and reaches it's brightest on the fourth touch, respectively. Finally the fifth touch switches the light off.



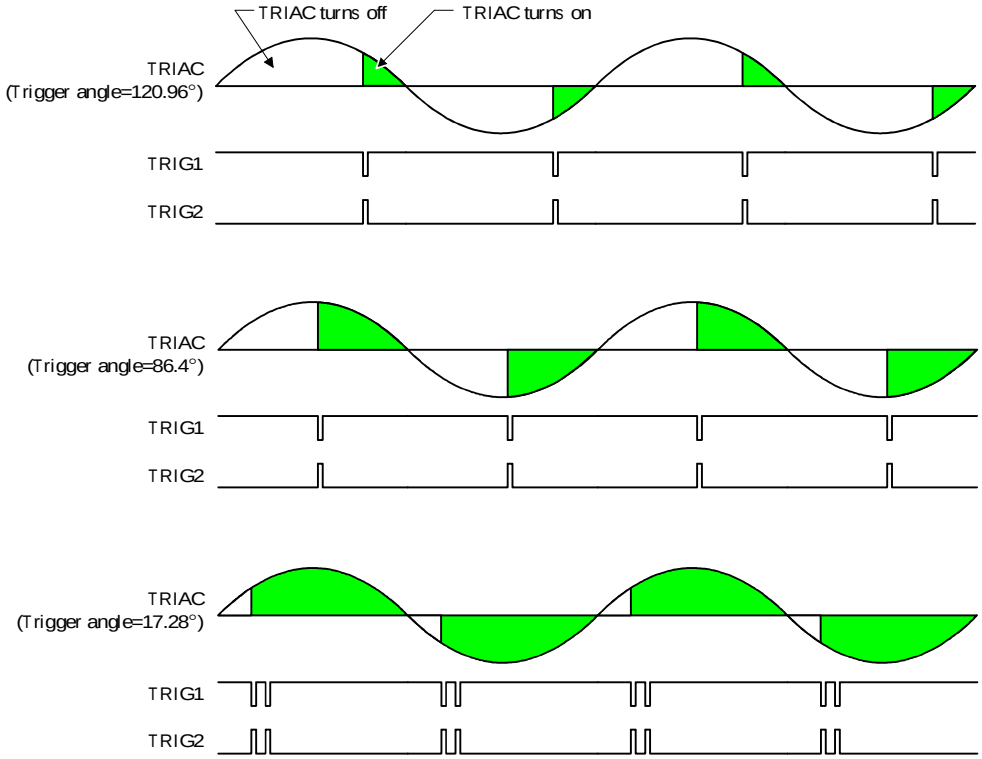
- ON/OFF switch (for the HT7704C)

  The initial touch turns the light on. When touched again, the light is turned off, and so on.

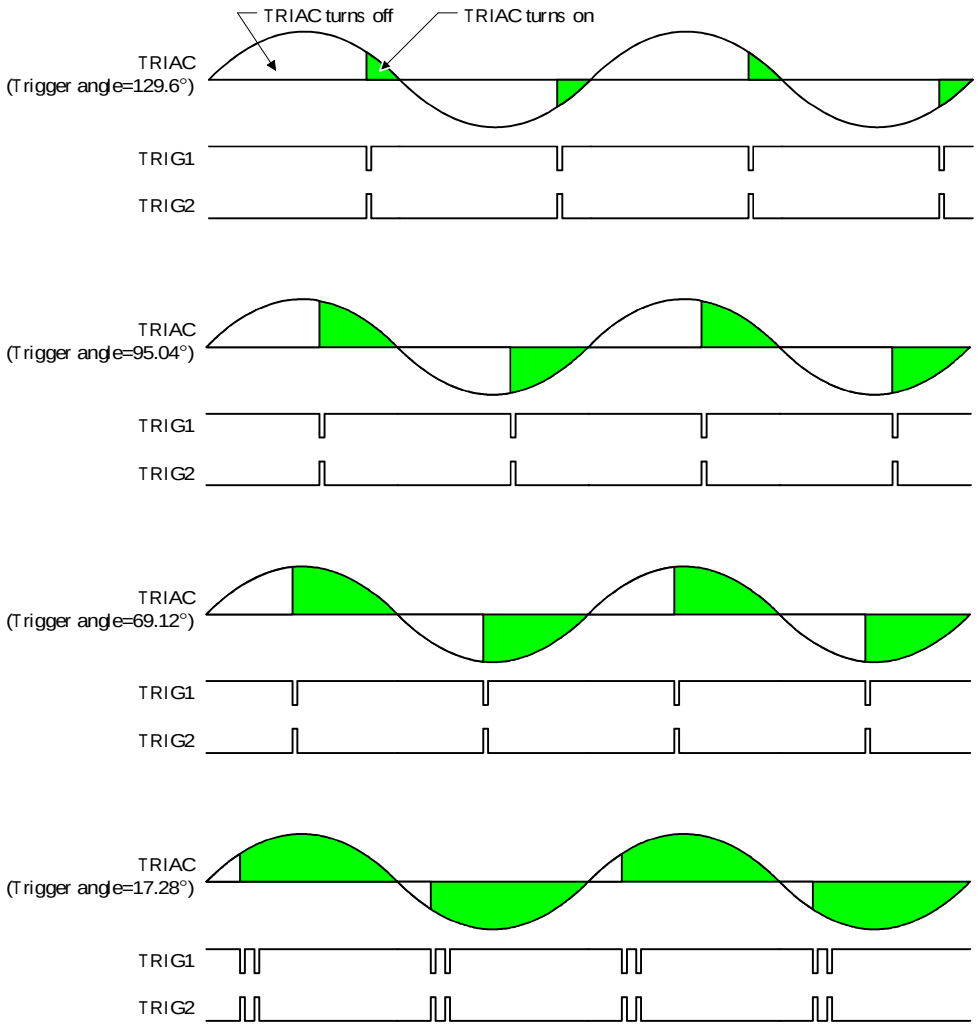


Timing Diagram

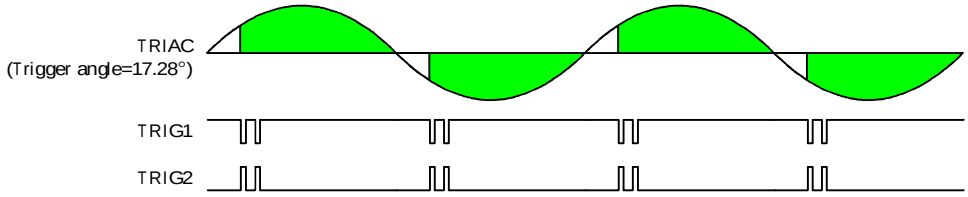
3 steps trigger angle (F_{OSC}=400KHz)



4 steps trigger angle (F_{OSC}=400KHz)

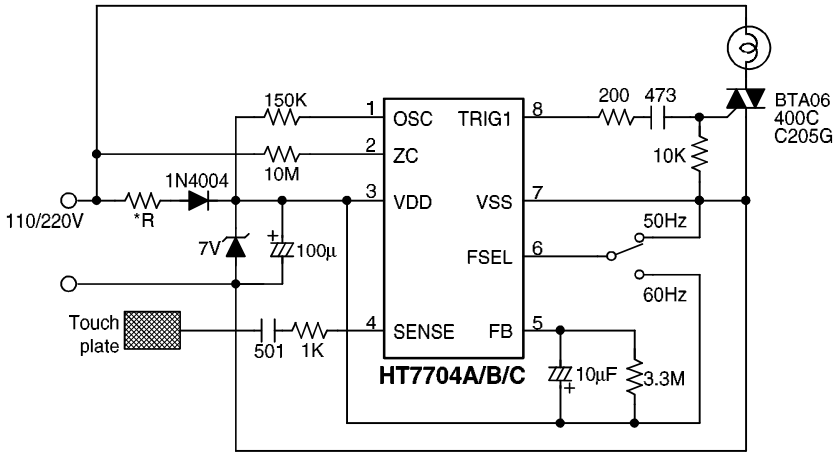


On/off trigger angle (F_{OSC}=400KHz)



Application Circuit

Package form



* Note: 1) R=22KΩ/2W when the AC power supply is 110V.
R=43KΩ/2W when the AC power supply is 220V.

2) Selection table

IC No.	Operating mode
HT7704A	3 steps of controllable brightness
HT7704B	4 steps of controllable brightness
HT7704C	On/off