
DC LED lightness regulation touch IC

Outline

- The TTP118-BA6 is a touch pad detector IC which offers 1 touch key. Stable sensing method can cover diversity conditions. The touching detection IC is designed for DC LED lightness regulation with diverse pad size. Low power consumption and wide operating voltage are the contact key features for DC or AC application.

Characteristic

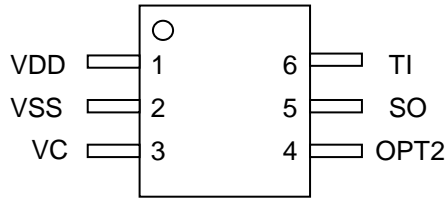
- Operating voltage 2.4V ~ 5.5V
- Built-in low power on initial(POR) and voltage reset (LVR) function
- Lower Operating Current (no load)
 - @VDD=3.3V, typical 4.0uA, maximum 8uA
 - @VDD=5.0V, typical 8.0uA, maximum 16uA
- The response time about 96mS at standby mode
- Sensitivity can adjust by the capacitance (1~47nF) outside
- SO pin is CMOS PWM output can be lightness regulation, PWM frequency is 31KHz @VDD=5.0V.
- After power-on have about 0.25 seconds stable-time, during the time do not touch the key pad, and the function is disabled.
- Auto calibration for life
The re-calibration period is about 62.5 milliseconds within 4 seconds after power-on. Power on after 4 seconds then it returns to standby mode, then the re-calibration period change to about 1 second.

Applications

- DC LED lightness regulation consumer products

Pin assignment

SOT23-6L

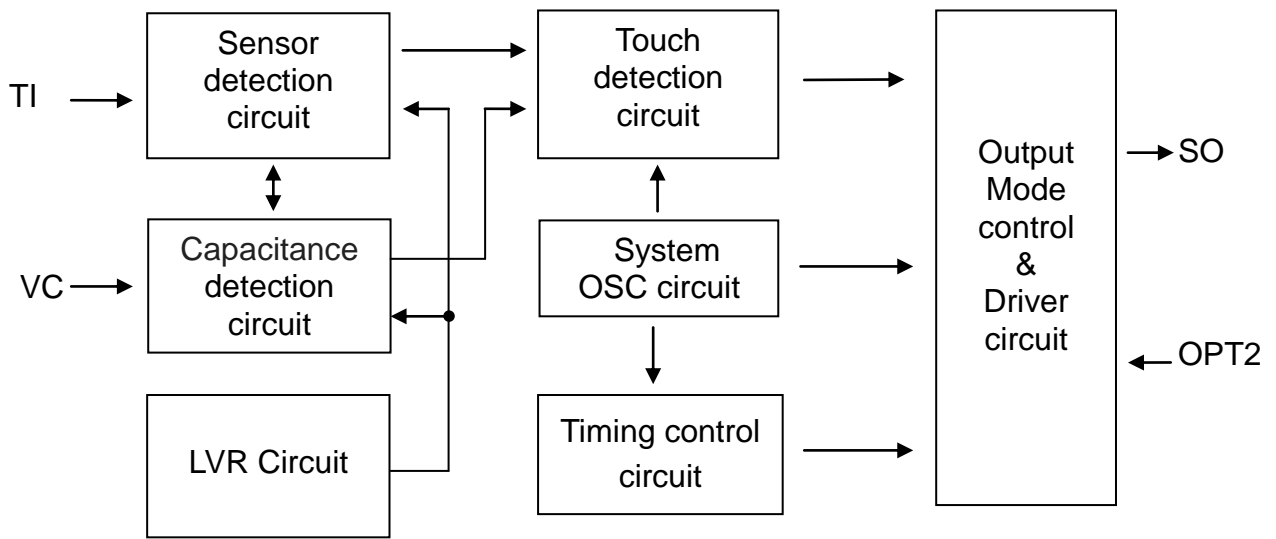

Pin Description

Pin NO	Pin Name	Type	Pin Description
1	VDD	P	Positive power supply
2	VSS	P	Negative power supply, ground
3	VC	I/O	Capacitance detection
4	OPT2	I-PH	Continuously or three step lightness regulation selection, 0=> three steps diming (low →Middle→High→Off); 1(Default)=> continuously diming with lightness-memory
5	SO	O	CMOS output pin
6	TI	I/O	Input sensor port

Pin Type

- I COMS input only
- O CMOS push-pull output
- I/O COMS I/O
- P Power / Ground
- I-PH CMOS input and pull-high resister
- I-PL CMOS input and pull-low resister
- OD Open drain output, have no Diode Protective circuit

Block diagram



Electrical Characteristics

- Absolute maximum ratings**

Parameter	Symb	Conditions	Rating	Unit
Operating Temperature	T _{OP}	—	-40~+85	°C
Storage Temperature	T _{STG}	—	-50~+125	°C
Supply Voltage	VDD	Ta=25°C	VSS-0.3~VSS+5.5	V
Input Voltage	V _{IN}	Ta=25°C	VSS-0.3~VDD+0.3	V
Human Body Mode	ESD	—	4	KV

Note : VSS symbolizes for system ground

- DC / AC characteristics : (Test condition at room temperature = 25 °C)**

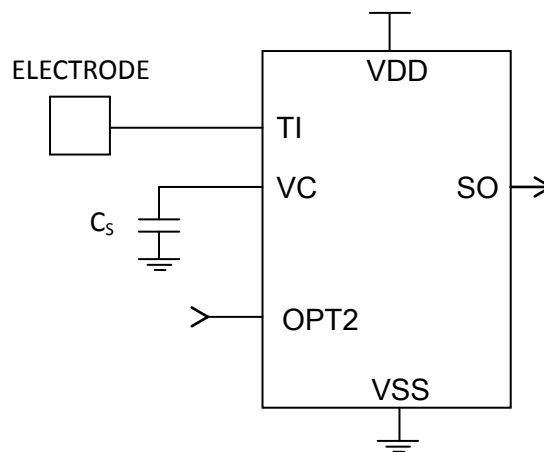
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	VDD		2.4	3.3	5.5	V
System oscillator	F _{OSC}	VDD=5.0V	-	16K	-	Hz
Operating Current (Standby mode)	I _{OPL}	VDD=3.3V, VC=10nF	-	4.0	8.0	uA
		VDD=5.0V, VC=10nF	-	8.0	16.0	uA
Input Ports	V _{IH}	Input High Voltage	2/3	-		VDD
	V _{IL}	Input Low Voltage		-	1/3	VDD
Output Port Source Current	I _{OH}	VDD=3.3V, V _{OH} =2.8V	-	-3.5	-	mA
		VDD=5.0V, V _{OH} =4.5V	-	-5.0	-	mA
Output Port Sink Current	I _{OL}	VDD=3.3V, V _{OL} =0.5V	-	8.0	-	mA
		VDD=5.0V, V _{OL} =0.5V	-	12.0	-	mA
PWM output frequency	F _{PWM}	VDD=5.0V	-	31K	-	Hz
Output Response Time	T _R	VDD=5.0V at standby mode	-	96	-	mS
		VDD=5.0V at detective mode	-	48	-	ms

Function Description

I . Sensitivity adjustment

The total loading of electrode size and capacitance of connecting line on PCB can affect the sensitivity. C_s the sensitivity adjustment must according to the practical application on PCB. The TTP118-BA6 offers some methods for adjusting the sensitivity outside.

1. by the electrode size
Under other conditions are fixed. Using a larger electrode size can increase sensitivity. Otherwise it can decrease sensitivity. But the electrode size must use in the effective scope.
2. by the panel thickness
Under other conditions are fixed. Using a thinner panel can increase sensitivity. Otherwise it can decrease sensitivity. But the panel thickness must be below the maximum value.
3. by the value of C_s (please see the down figure)
Under other conditions are fixed. PAD VC to VSS capacitor C_s can adjust sensitivity, When adding the value of C_s will increase sensitivity in the useful range ($1nF \leq C_s \leq 47nF$)



II . Output mode (By OPT2 pin option)

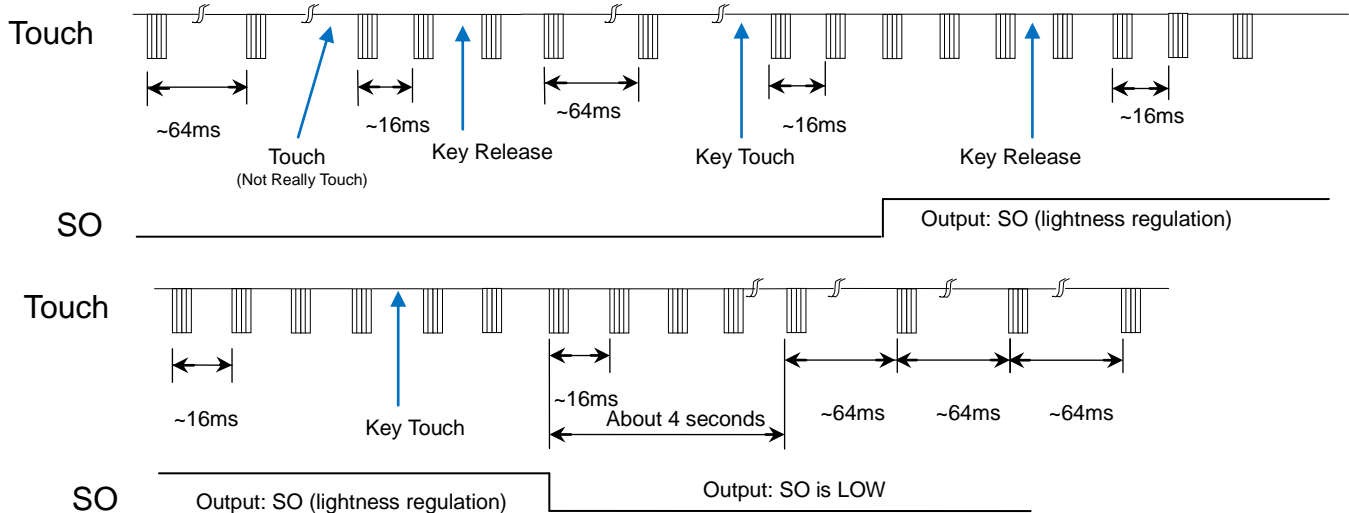
OPT2: Output SO continuously or three step lightness regulation selection.

Pin SO (CMOS output) option features :

OPT2	Pin SO option features
1	continuously lightness regulation selection
0	three step lightness regulation

III. Stand-by mode key De-bounce time

- The TTP118-BA6 is standby mode, it will be saving power. When detecting key touch, it will switch to detective mode. Until the key touch is released and will keep a time about 4 sec. Then it returns to standby mode. At standby mode SO output response time about 96ms. At detective mode SO output response time about 48 milliseconds.



- OPT2=1(Default): Regulate lightness discretely with lightness-memory

2-1.The Light holds off state when the circuit electrified initially.

2-2.The touch operation with the duration less than 550ms could regulate the on-off state of the light. One touch operation turns the light on and one more operation turns it off. There is no lightness buffer when LED switches between on and off state, and the initial lightness is 90% of the max lightness.

2-3.A long-playing touch operation with a duration more than 550ms could regulate the lightness continuous range. A long-playing touch operation makes the lightness increase continuously and when the touch operation ends the lightness decrease continuously and when the touch operation ends the lightness is also on the current level. If the duration of the touch operation is more than 3 seconds, the lightness will be lowest. The lightness PWM duty cycle minimum is 2%, the maximum is 100%.

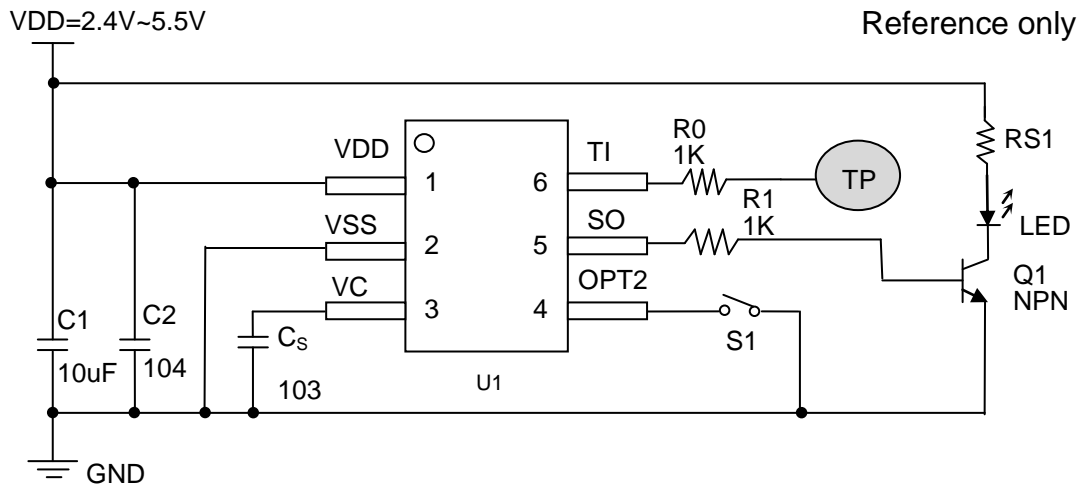
2-4.Anytime for users could switch between common touch operation and long-playing touch operation, and either function will not be influence by on another. The first touch operation in the state where the light is off, the light gradually decreases from 90%(PWM duty cycle).

2-5.This function does not have lightness memory without lightness buffer, regulating memory function based on regulating function. This is, in the case of continuous power supply, the lightness will be remembered each time the touch is turned off, and the lightness will be used as the initial lightness when the next touch is turned on.

2-6. In the case of power off, the lightness memory function is invalid.

2-7. The direction of the first dimming after turning on the light is determined by the lightness value of the previous memory. If the memory lightness value is greater than 50%, dim down, if the memory lightness value is less than 50%, dim up. After initial power-on or power-off, re-power on, the initial lightness of the first turn-on is fixed at 90% maximum lightness, the direction of first dimming is fixed to dim down.

Application circuit



P.S. :

1. On PCB, the length of lines from touch pad to IC pin shorter is better. And the lines do not parallel and cross with other lines.
2. The power supply must be stable. If the supply voltage drift or shift quickly, maybe causing sensitivity anomalies or false detections.
3. The material of panel covering on the PCB can not include the metal or the electric element. The paints on the surfaces are the same.
4. The C2 capacitor must be used between VDD and VSS; and should be routed with very short tracks to the device's VDD and VSS pins (TTP118-BA6).
5. The capacitance C_S can be used to adjust the sensitivity. The value of C_S use larger, then the sensitivity will be better. The sensitivity adjustment must according to the practical application on PCB. The range of C_S value are 1nF~47nF.
6. The sensitivity adjustment capacitors (C_S) must use smaller temperature coefficient and more stable capacitors. Such are X7R, NPO for example. So for touch application, recommend to use NPO capacitor, for reducing that the temperature varies to affect sensitivity.
7. Medium type for adjustment capacitors (C_S)

C_S value Table

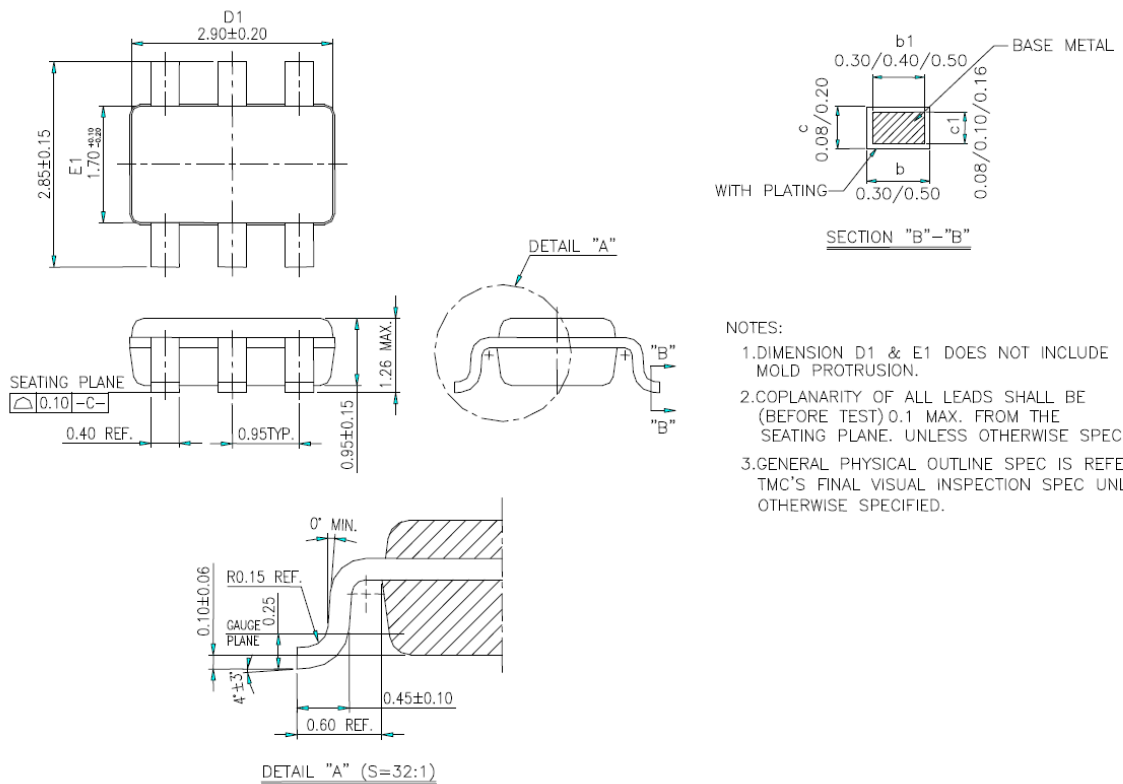
Medium Types	C_S Capacitance (Reference)
Acrylic sheet \leq 3mm	6.8nF/25V
3mm \leq Acrylic sheet \leq 6mm	10nF/25V
Acrylic sheet \leq 6-10mm	22nF/25V

BOM table

Symbol	Type	Element parameter
C1	Electrolytic capacitor	10uF/25V
C2	Ceramic capacitor	104
C _s	capacitor*	Reference Cs value Table
R0	Carbon film resistor	1KΩ reference application
S1	switch	Single pole single throw switch

Package outline

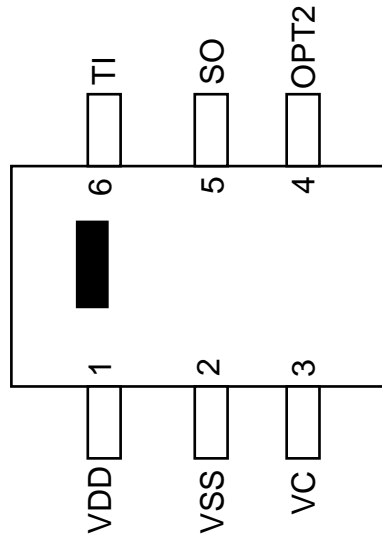
Package Type: SOT23-6L



Package configuration

TTP118-BA6N

Package Type SOT23-6L



Ordering Information

TTP118

Package Type	Chip Type	Wafer Type
TTP118-BA6N	No support	No support

REVISION HISTORY :

- 2019/03/29: Initial version V1.0
- 2019/04/10: Modify version V1.1