3 keys Touch Pad Detector IC

Content

Outline

TTP119-BB8 is a touch pad detector IC which offers 3 touch keys. Stable sensing method can cover diversity conditions, which can widely meet the needs of different applications and can realize the touch function under the condition of medium isolation protection. It has high security (such as Glass, acrylic and other materials).The touching detection IC is designed for replacing traditional direct button key with diverse pad size. Low power consumption and wide operating voltage are the contact key features for DC or AC application.

Characteristic

- Operating voltage 2.4~5.5V
- Standby mode Current (no load)

  @VDD=3.3V, typical 7uA, maximum 14uA.

  @VDD=5.0V, typical 14uA, maximum 28uA.
- Built-in power on initial(POR) and low voltage reset (LVR) function
- Output Response Time (minimum) @VDD=5.0V

  @ Detective mode 48ms.

  @ Standby mode 160ms.
- There are two ways to adjust channel sensitivity

  (1) Can be adjusted uniformly by an external capacitor (C_{S0}) (C_{S0}:1~47nF).

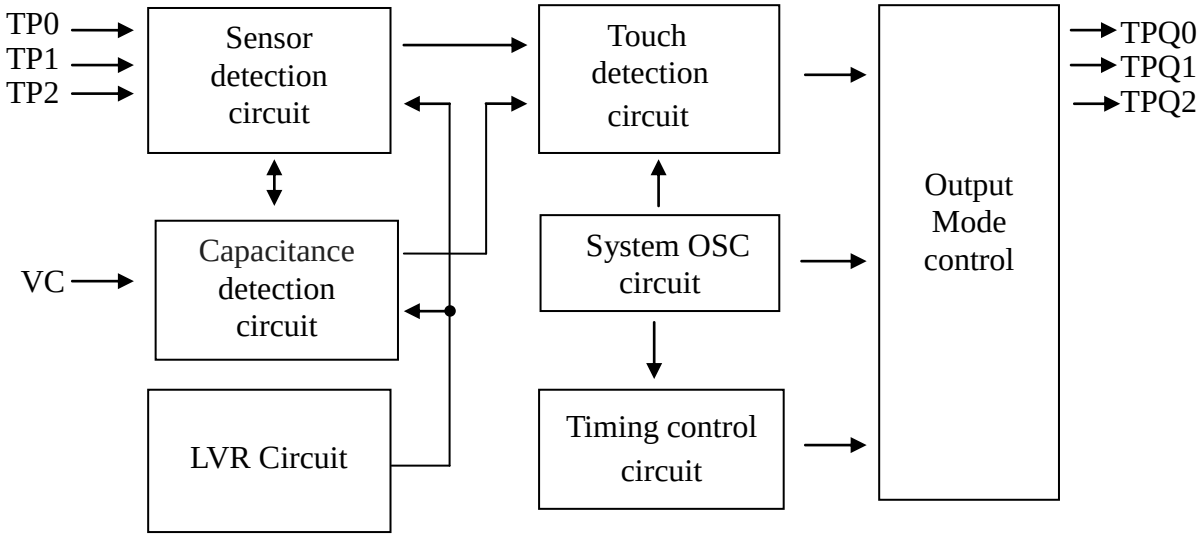
  (2) Each channel has an independent external capacitor (C_{TX}) for adjustment (C_{TX}:1~50pF).
- Provide direct mode、CMOS output、active low
- Provide multi-key output mode
- Provide the maximum on time infinite or 16 seconds
- Auto calibration for life

  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

- Wide consumer products
- Button key replacement

Block diagram



Pin Description

Pin no	Pin name	Type	Assignment
0	VSS	P	Negative power supply, ground
1	TP0	I/O	TP0 touch input sensor port
2	TP1	I/O	TP1 touch input sensor port
3	TP2	I/O	TP2 touch input sensor port
4	VC	I/O	Capacitance detection
5	VDD	P	Positive power supply
6	TPQ2	O	Q2 output port, correspond TP2 touch input sensor port
7	TPQ1	O	Q1 output port, correspond TP1 touch input sensor port
8	TPQ0	O	Q0 output port, correspond TP0 touch input sensor port

Pin Type

- I CMOS input only
- O CMOS output
- I／O CMOS input／output
- P Power／Ground

Electrical Characteristics

- **Absolute maximum ratings**

Parameter	Symbol	Conditions	Rating	Unit
Operating Temperature	TOP	—	-40～+85	℃
Storage Temperature	TSTG	—	-50～+125	℃
Supply Voltage	VDD	Ta=25°C	VSS-0.3～VSS+5.5	V
Input Voltage	VIN	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 ℃）**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	VDD		2.4	3.3	5.5	V
Standby mode current (no load)	I_{st}	VDD=3.3V, VC=10nF	-	7.0	14	uA
		VDD=5.0V,VC=10nF	-	14	28	uA
Detective mode current (no load)	I_{OP}	VDD=3.3V, VC=10nF	-	20	40	uA
		VDD=5.0V,VC=10nF	-	30	60	uA
System oscillator	F_{OSC}	VDD =3.3V	-	17K	-	Hz
		VDD =5.0V	-	16K	-	Hz
Input ports	V_{IL}	Input low voltage	-	-	0.2	VDD
	V_{IH}	Input high voltage	0.8	-	1.0	VDD
TPQ0~2 Output port Sink Current	I_{OL}	VDD=3.3V, VOL=0.5V	-	10	-	mA
		VDD=5.0V, VOL=0.5V		14		
TPQ0~2 Output port Source Current	I_{OH}	VDD=3.3V, VOH=2.8V	-	-6.0	-	mA
		VDD=5.0V, VOH=4.5V		-9.0		
TPQ0~2 Output response time	T_R	VDD=3.3V, standby mode	-	150	-	ms
		VDD=3.3V, detective mode		45		
		VDD=5.0V, standby mode	-	160	-	ms
		VDD=5.0V, detective mode		48		

Function Description

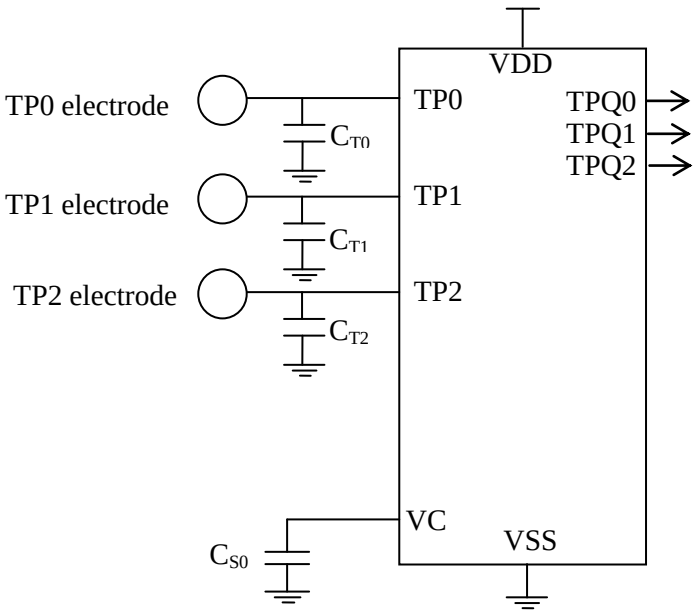
Ⅰ. Power-On and Reset instruction

The reference value is refreshed every 62.5 milliseconds within 4.0 seconds after power-on. If the touch button is not touched after 4.0 seconds of power-on, the recalibration cycle switching time is about 1.0 second. The output port returns to its initial state when rest.

Ⅱ. Sensitivity adjustment

The total loading of electrode size and capacitance of connecting line on PCB can affect the sensitivity. The sensitivity adjustment must according to the practical application on PCB. The TTP119–BB8 offers some methods for adjusting the sensitivity outside.

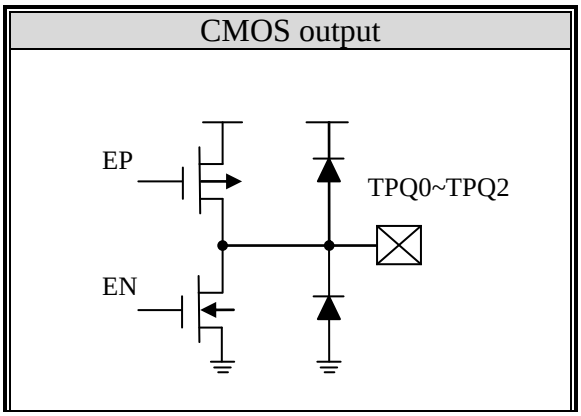
1. By the electrode size
   Under other conditions are fixed. Using a larger electrode size can increase sensitivity. Otherwise it can decrease sensitivity. But the electrode size must use in the effective scope.
2. By the panel thickness
   Under other conditions are fixed. Using a thinner panel can increase sensitivity. Otherwise it can decrease sensitivity. But the panel thickness must be below the maximum value.
3. By the value of C_{T0}～C_{T2} capacitor（please see the down figure）
   Under other conditions are fixed. Add the capacitor C_{T0}～C_{T2}, can fine tune the sensitivity for single key, that lets all key's sensitivity identical. When do not use any capacitor to VSS, the sensitivity is most sensitive. When adding the values of C_{T0}～C_{T2} will reduce sensitivity in the useful range ($1 \leqq C_{T0}$~$C_{T2} \leqq 50$pF).
4. By the value of C_{S0} capacitor（please see the down figure）
   Under other conditions are fixed. PAD VC to VSS capacitor Cs_0 can adjust sensitivity, when adding the value of C_{S0} will increase sensitivity in the useful range $1nF \leqq C_{S0} \leqq 47nF$.



Ⅲ. Output mode

TTP119-BB8 output（TPQ0~TPQ2）has CMOS output direct mode, active low, and multi keys output.

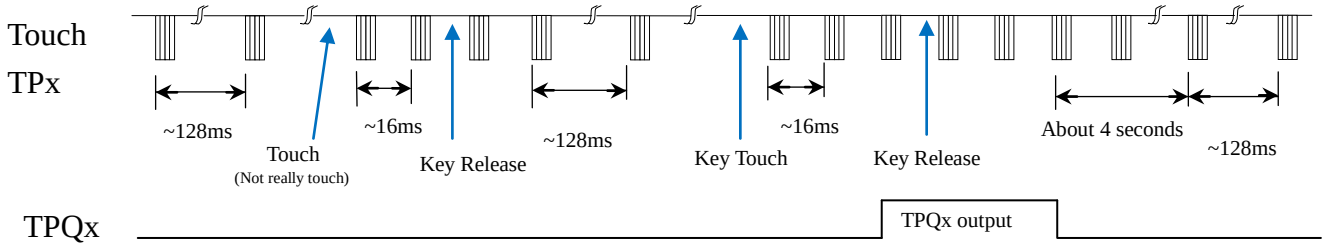
Ⅳ. CMOS output



V. Standby Mode Touch and TPQx output

IC will save power in standby mode. 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 VDD=5V, the standby mode TPQx output response time about 160ms, the detective mode TPQx output response time about 48 milliseconds. (x=0,1,2)

TPQx maximum on time (MOT) is 16 seconds

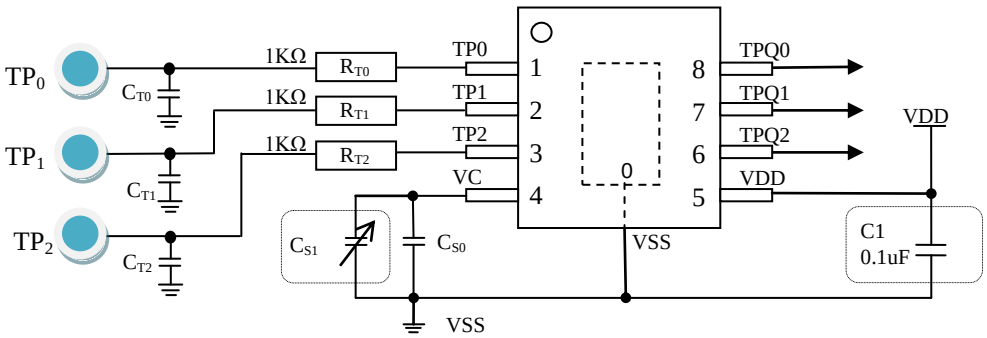


Application circuit

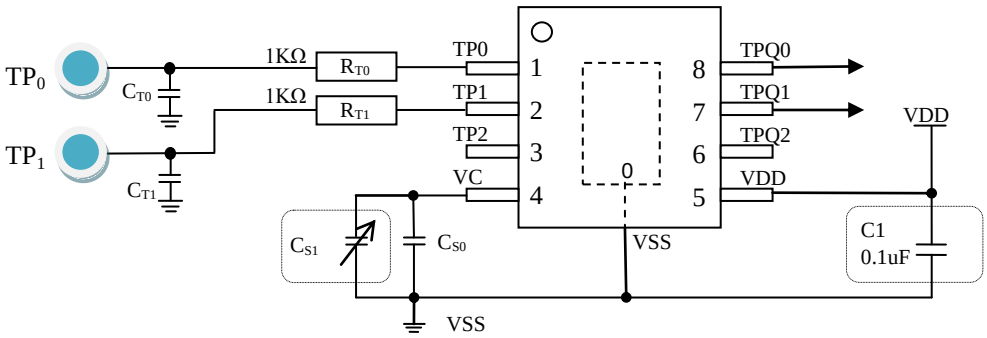
Reference only

Ⅰ. TTP119-BB8 application Circuit

1. 3 touch Keys



2. Option 2 touch keys



Note： 1. C1, C_{S1} depending on the application.

2. Please float the unused input sensor port (for example, if TP2 is not used, please float TP2).

Ⅱ. PCB layout note

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 C1 capacitor must be used between VDD and VSS; and should be routed with very short tracks to the device's VDD and VSS pins.
5. The capacitance C_{T0}~C_{T2} can be used to adjust the sensitivity. The value of C_{T0}~C_{T2} use smaller, then the sensitivity will be better. The sensitivity adjustment must according to the practical application on PCB. The range of C_{T0}~C_{T2} value are 1~50pF.
6. The capacitance C_{S0} can be used to adjust the sensitivity. The value of C_{S0} use larger, then the sensitivity will be better. The sensitivity adjustment must according to the practical application on PCB. The range of C_{S0} value are 1nF~47nF.
7. The sensitivity adjustment capacitors（C_{T0}~C_{T2}, C_{S0}）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.
8. Medium type for adjustment capacitors（C_{S0}）

Ⅲ. C_{S0} value table

Medium Types	**C_{S0}** Capacitance (Reference)
Acrylic sheet ≦ 3mm	6.8nF/25V
3mm ≦ Acrylic sheet ≦ 6mm	10nF/25V
Acrylic sheet ≦ 6-10mm	22nF/25V

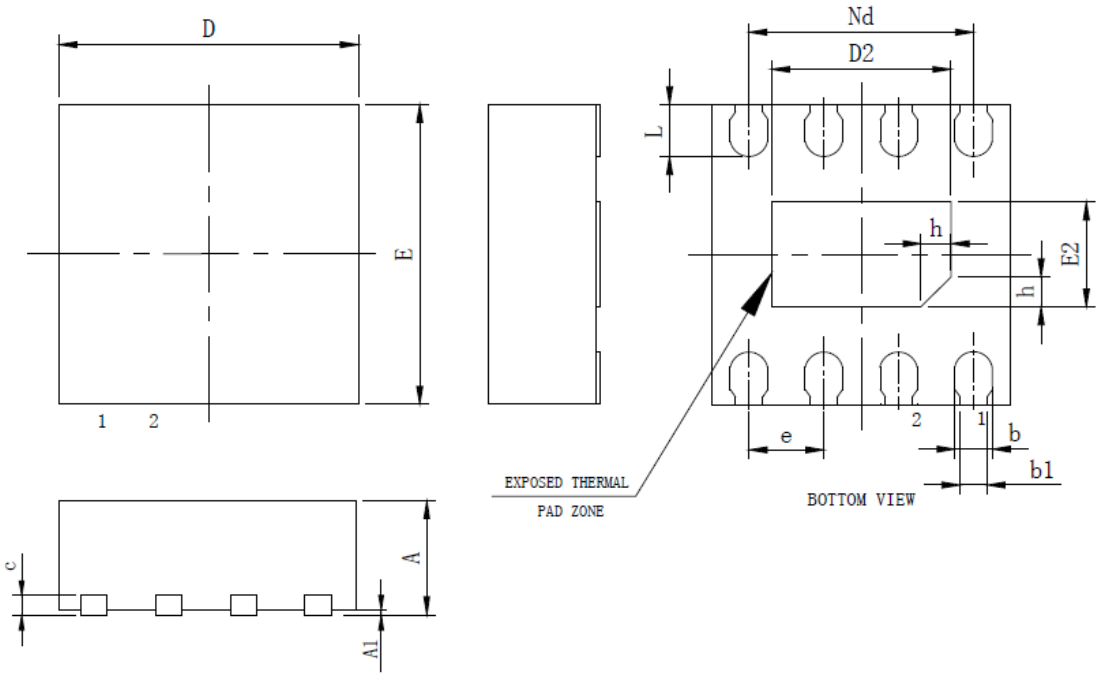
Ⅳ. BOM table

Symbol	Type	Element parameter
C_{S0}	capacitor	Reference Cs_0 value Table
C_{S1}	capacitor	0pF*
C1	Electrolytic capacitor	104*
C_{T0}～C_{T2}	capacitor	1pF～ 50pF
R_{T0}～R_{T2}	Carbon film resister	1KΩ*

Note: * Resistance and Capacitance value depends on the application.

Package outline

Package Type: DFN-8



Symbol Parameter (Unit : mm)														
A			A1			b			b1			c		
Min	Nom	Max	Min	Nom	Max	Min	Nom	Max		Typ		Min	Nom	Max
0.70	0.75	0.80		0.02	0.05	0.18	0.25	0.30		0.18 REF		0.18	0.20	0.25

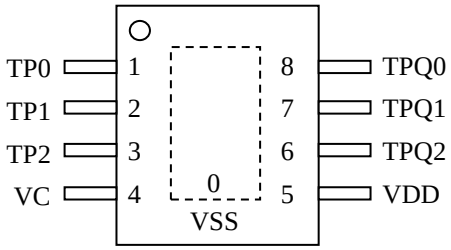
Symbol Parameter (Unit : mm)														
D			D2			e			Nd			E		
Min	Nom	Max	Min	Nom	Max		Typ			Typ		Min	Nom	Max
1.90	2.00	2.10	1.10	1.20	1.30		0.5 BSC			1.50 BSC		1.90	2.00	2.10

Symbol Parameter (Unit : mm)								
E2			L			h		
Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
0.60	0.70	0.80	0.30	0.35	0.40	0.15	0.20	0.25

Package configuration

TTP119-BB8

Package type: DFN-8



Ordering Information

TTP119

Package Item	Package Type	Chip Type	Wafer Type
TTP119-BB8	DFN-8	No support	No support

Revision History:

1. 2021/06/01：Version: 1.0
   Initial version.