2 keys Touch Pad Detector IC

Outline

- The TTP232-CA6 TonTouch[TM] IC is capacitive sensing design specifically for touch pad controls. The device built in regulator for touch sensor. Stable sensing method can cover diversity conditions. Human interfaces control panel links through non-conductive dielectric material. The main application is focused at replacing of the mechanical switch or button. The ASSP can independently handle the 2 touch pads with 2 direct output pins

Characteristic

- Operating voltage 2.4V ~ 5.5V
- Built-in regulator for touch sensor
- Operating current, @VDD=3V no load
- At stand-by typical 2.5uA
- The maximum touch response time about 220mS from stand-by state @VDD=3V
- Sensitivity can adjust by the capacitance（1~50pF）outside for each touch pad
- Output mode fix direct mode and active low mode
- Have the maximum on time 16sec
- Fix multi-key feature
- After power-on have about 0.5sec 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 1 sec within 8 sec after power-on. When key has been touched within 8 sec or key has not been touched more than 8 sec after power-on, then the re-calibration period change to 4 sec

Applications

- Wide consumer products
- Button key replacement

Block diagram
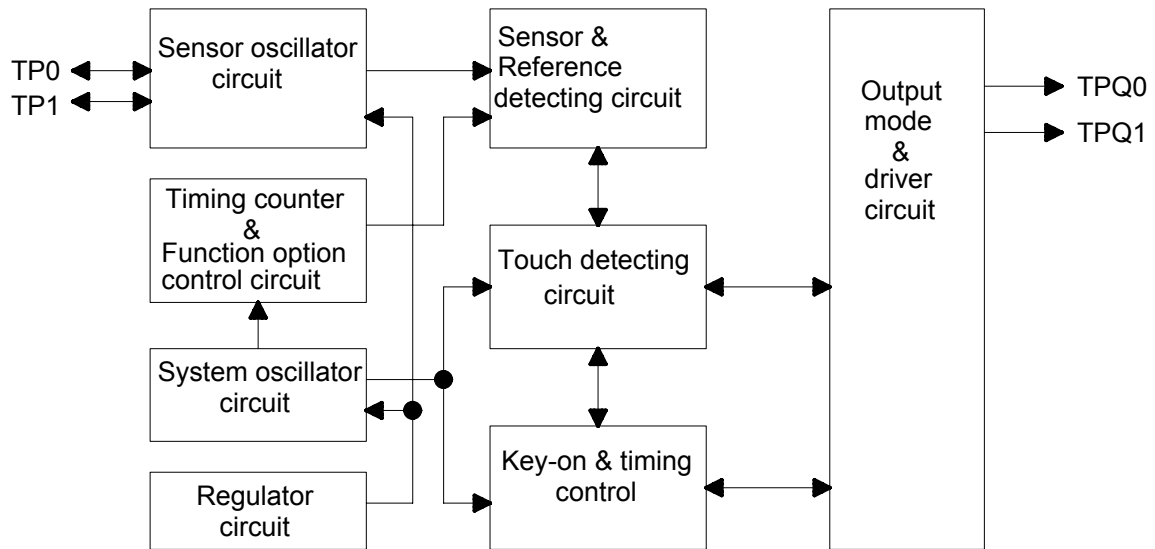
Pin Description

Pin NO	Pin Name	Type	Pad Description
1	TPQ0	O	CMOS output pin for TP0 touch input pin
2	VSS	P	Negative power supply, ground
3	TPQ1	O	CMOS output pin for TP1 touch input pin
4	TP1	I/O	Touch pad input pin
5	VDD	P	Positive power supply
6	TP0	I/O	Touch pad input pin

Pin Type

- I   CMOS input only
- O   CMOS push-pull output
- I／O   CMOS 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

Electrical Characteristics

- ### Absolute maximum ratings

Parameter	Symbol	Conditions	Rating	Unit
Operating Temperature	T_{OP}	—	-40～+85	℃
Storage Temperature	T_{STG}	—	-50～+125	℃
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	—	5	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	5.5	V
Internal Regulator Output	VREG		2.2	2.3	2.4	V
System oscillator	FFAST	VDD=3V	-	512K	-	Hz
	FLOW		-	16K	-	
Operating Current	I_{OP}	Stand-by，VDD=3V output no load	-	2.5	-	uA
Input Ports	V_{IL}	Input Low Voltage	0	-	0.2	VDD
Input Ports	V_{IH}	Input High Voltage	0.8	-	1.0	VDD
Output Port Sink Current	I_{OL}	VDD=3V, V_{OL}=0.6V	-	8	-	mA
Output Port Source Current	I_{OH}	VDD=3V, V_{OH}=2.4V	-	-4	-	mA
Output Response Time	T_R	VDD=3V、At touch operation	-	-	60	mS
		VDD=3V、At stand-by	-	-	220	
Input Pin Pull-high Resistor	R_{PH}	VDD=3V	-	30K	-	ohm

Function Description

Ⅰ. Sensitivity adjustment

The total loading of electrode size and capacitance of connecting line on PCB can affect the sensitivity. So the sensitivity adjustment must according to the practical application on PCB. The TTP232-CA6 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 Cs0~Cs1（please see the down figure）

    Under other conditions are fixed. Add the capacitors Cs0~Cs1 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 Cs0~Cs1 will reduce sensitivity in the useful range（$1 \leqq Cs0$~$Cs1 \leqq 50pF$）.
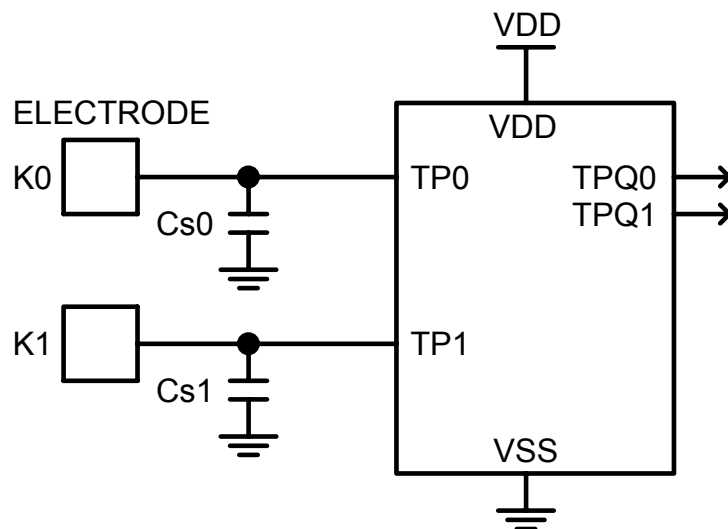
Ⅱ. Output mode

The TTP232-CA6 outputs（TPQ0~TPQ1）fix direct mode and active low mode.

Ⅲ. Maximum key on duration time

If some objects cover in the sense pad, and causing the change quantity enough to be detected. To prevent this, the TTP232-CA6 sets a timer to monitor the detection. The timer is the maximum on duration time about 16sec. When the detection is over the timer, the system will return to the power-on initial state, and the output becomes inactive until the next detection.

Ⅳ. Key operating mode

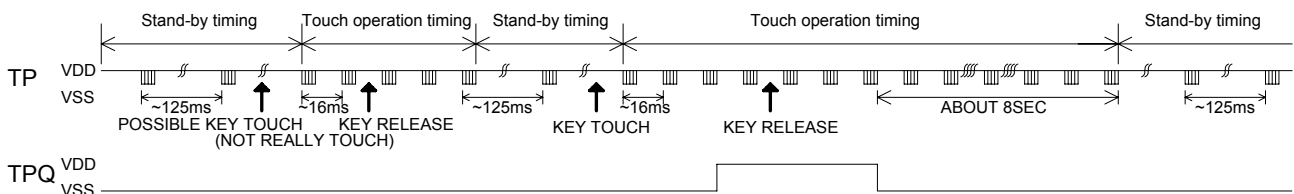The TTP232-CA6 fixes Multi-key function.

Multi-key mode：The TP0-TP1 can be detected 2 keys the same time.
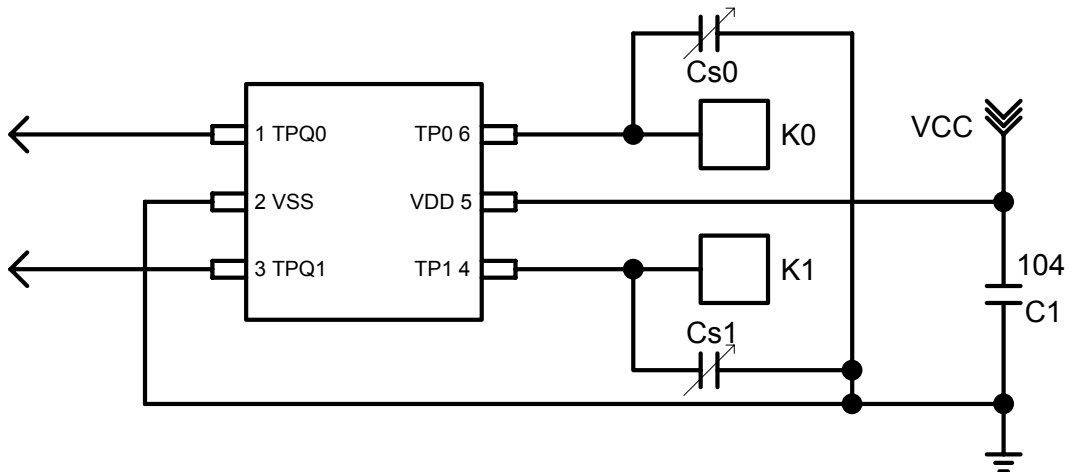
Ⅴ. The touch response time

The touch response time of TTP232-CA6 is about 220msec from stand-by state.

Ⅵ. The operating timing for key scanning

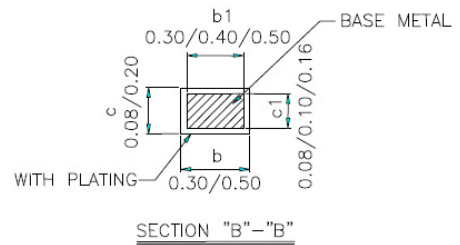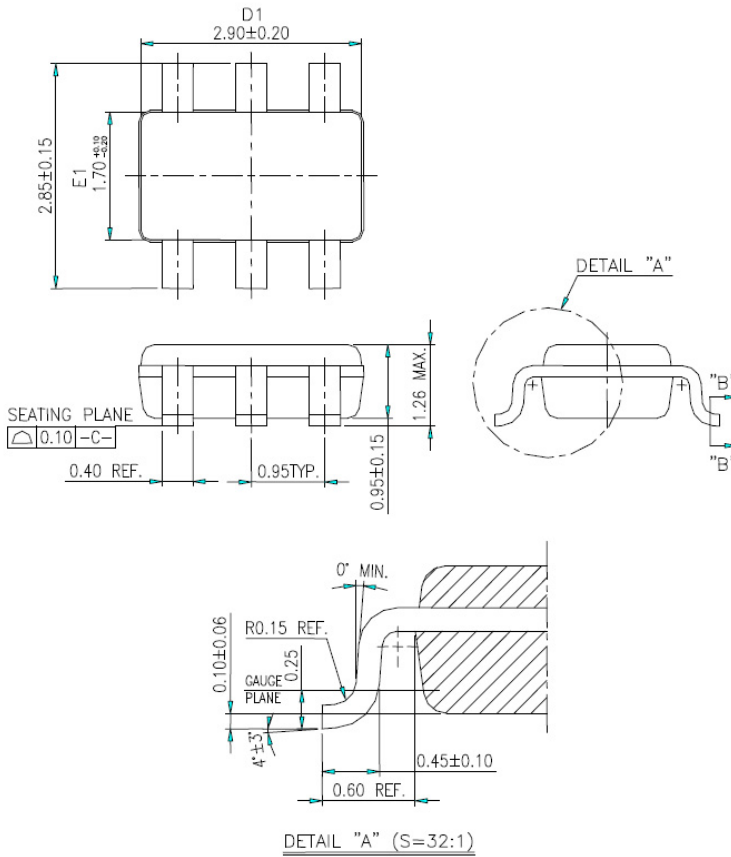The states and timing for key scanning

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 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（TTP232-CA6）.

5. The capacitance Cs0~Cs1 can be used to adjust the sensitivity. The value of Cs0~Cs1 use smaller, then the sensitivity will be better. The sensitivity adjustment must according to the practical application on PCB. The range of Cs0~Cs1 value are 1~50pF.

6. The sensitivity adjustment capacitors（Cs0~Cs1）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.

Package outline

D1
2.90±0.20

E1
2.85±0.15
1.70 +0.10/-0.20

1.26 MAX.

0.95±0.15

SEATING PLANE

△ 0.10 -C-

0.40 REF.   0.95TYP.

DETAIL "A"

"B"
"B"

b1
0.30/0.40/0.50

c
0.08/0.20

c1
0.08/0.10/0.16

b
0.30/0.50

BASE METAL
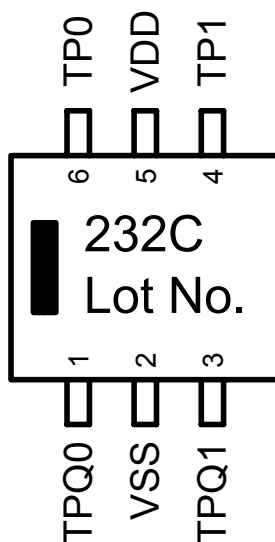
WITH PLATING

SECTION "B"-"B"

NOTES:

1. DIMENSION D1 & E1 DOES NOT INCLUDE MOLD PROTRUSION.

2. COPLANARITY OF ALL LEADS SHALL BE (BEFORE TEST) 0.1 MAX. FROM THE SEATING PLANE. UNLESS OTHERWISE SPECIFIED.

3. GENERAL PHYSICAL OUTLINE SPEC IS REFER TO TMC'S FINAL VISUAL INSPECTION SPEC UNLESS OTHERWISE SPECIFIED.

0° MIN.

R0.15 REF.

0.10±0.06

0.25

GAUGE PLANE

4°±3°

0.45±0.10

0.60 REF.

DETAIL "A" (S=32:1)

Package configuration

TTP232-CA6

Package Type SOT23-6

```
        TP0   VDD   TP1
         │     │     │
        ┌6─────5─────4┐
        │▐            │
        │▐   232C     │
        │▐   Lot No.  │
        │             │
        └1─────2─────3┘
         │     │     │
        TPQ0  VSS   TPQ1
```

TTP232-CA6		
Package Type	**Chip Type**	**Wafer Type**
TTP232-CA6	No support	No support