1 KEY TOUCH PAD DETECTOR IC

GENERAL DESCRIPTION

The TTP233-JA6 TonTouch[TM] is a touch pad detector IC which offers 1 touch key. The device built-in regulator for touch sensor. Stable sensing method can cover diversity condition. 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.

FEATURES

- Operating voltage 2.1V~5.5V
- Built-in regulator for touch sensor
- TTP233-JA6 Operating current @VDD=3V, no load
  At low power mode typical 2.5uA, maximum 5uA
  At fast mode typical 5uA, maximum 10uA
- The response time max about 60mS at fast mode, 220mS at low power mode @VDD=3V
- Sensitivity can adjust by the capacitance(1~50pF) outside
- Stable touching detection of human body for replacing traditional direct switch key
- Provides Fast mode and Low Power mode selection by pad option(LPMB pin)
- Q pin is CMOS direct output, active high.
- Have the maximum on time 80 sec
- After power-on have about 0.5 sec 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 be touched within 8 sec or key has not be touched more than 8 sec after power-on, then the re-calibration period change to 4 sec.

APPLICATION

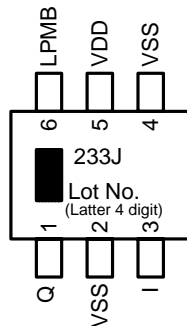- Wide consumer products
- Button key replacement

BLOCK DIAGRAM
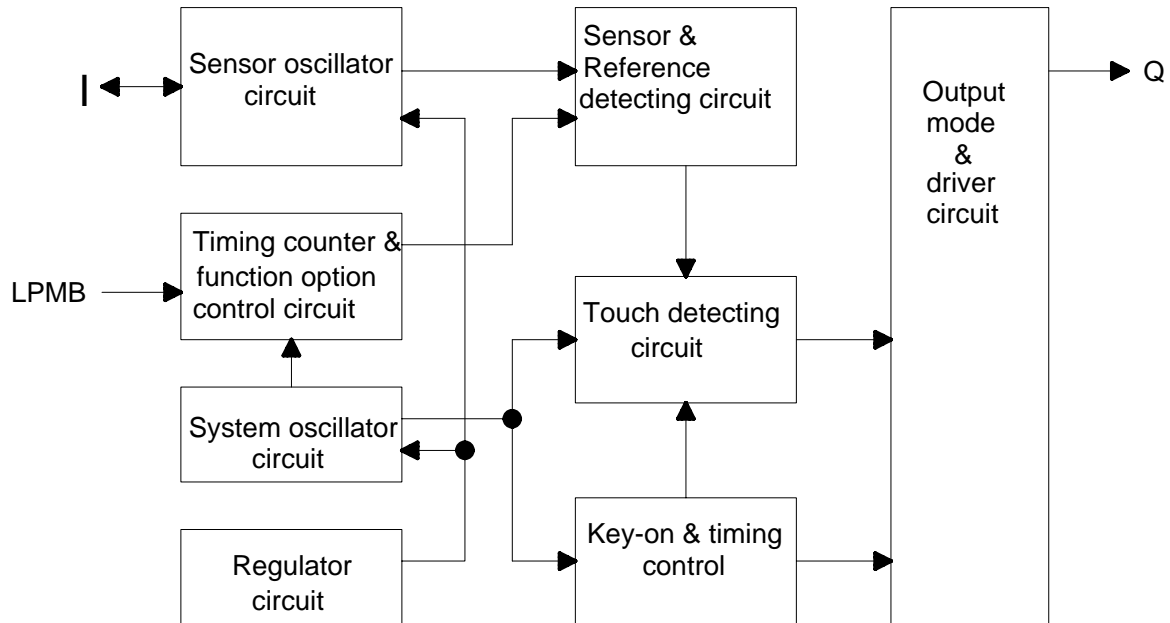
PACKAGE CONFIGURATION

TTP233-JA6 : Package Type SOT-23

TTP233-JA6 SOT-23

PAD DESCRIPTION

Pad No.	Pad Name	I/O Type	Pad Description
1	Q	O	CMOS output pin
2	VSS	P	Negative power supply, ground
3	I	I/O	Input sensor port
4	VSS	P	Negative power supply, ground
5	VDD	P	Positive power supply
6	LPMB	I-PH	Low power mode selection, 1(Default)=>Fast mode; 0=>Low power mode

Pin Type

O : CMOS push-pull output

I/O : CMOS I/O

I-PH : CMOS input and pull-high resister

P : Power / Ground

ELECTRICAL CHARACTERISTICS

・ **Absolute Maximum Ratings**

Parameter	Symbol	Conditions	Value	Unit
Operating Temperature	T_{OP}	—	-40 ~ +85	℃
Storage Temperature	T_{STG}	—	-50 ~ +125	℃
Power 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	—	7	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			2.1	3	5.5	V
Internal Regulator Output	**VREG**			1.9	2.0	2.1	**V**
System oscillator	Fsys	VDD=3V			16K		Hz
Sensor oscillator	F_{SEN}	VDD=3V no load		-	1M	-	Hz
Operating Current TTP233-JA6 IC	I_{OP}	VDD=3V output no load	Low power mode		2.5	5	uA
			Fast mode		5.0	10	
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 fast mode				60	mS
		VDD=3V, At low power mode				220	
Input Pin Pull-high Resistor	R_{PH}	VDD=3V, (LPMB)			35K		ohm

FUNCTION DESCRIPTION

1. 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 TTP233-JA6 offers some methods for adjusting the sensitivity outside.

1-1 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.

1-2 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.

1-3 by the value of Cs (please see the down figure)

Under other conditions are fixed. When do not use the Cs to VSS, the sensitivity is most sensitive. When adding the values of Cs will reduce sensitivity in the useful range (1pF　Cs　50pF).
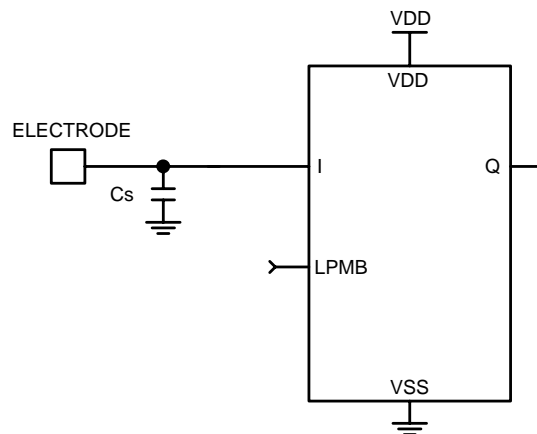
2. Output mode

The TTP233-JA6 Q pin is CMOS direct output, active high

3. 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 TTP233-JA6 sets a timer to monitor the detection. The timer is the maximum on duration time. It is set about 80 sec at 3V. 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.

4. Fast and Low power mode selection (By LPMB pad option)

The TTP233-JA6 has Fast mode and Low Power mode to be selected. It depends on the state of LPMB pad. When the LPMB pin is opened or connected to VDD, the TTP233-JA6 runs in Fast mode. When the LPMB pin is connected to VSS, the TTP233-JA6 runs in Low Power mode.
In the Fast mode response time is faster, but the current consumption will be increased. In the Low Power mode it will be saving power, but will be slowing response time for first touch. When it awaked in fast mode, the response time is the same the fast mode. In this mode when detecting key touch, it will switch to Fast mode. Until the key touch is released and will keep a time about 10 sec. Then it returns to Low Power mode.
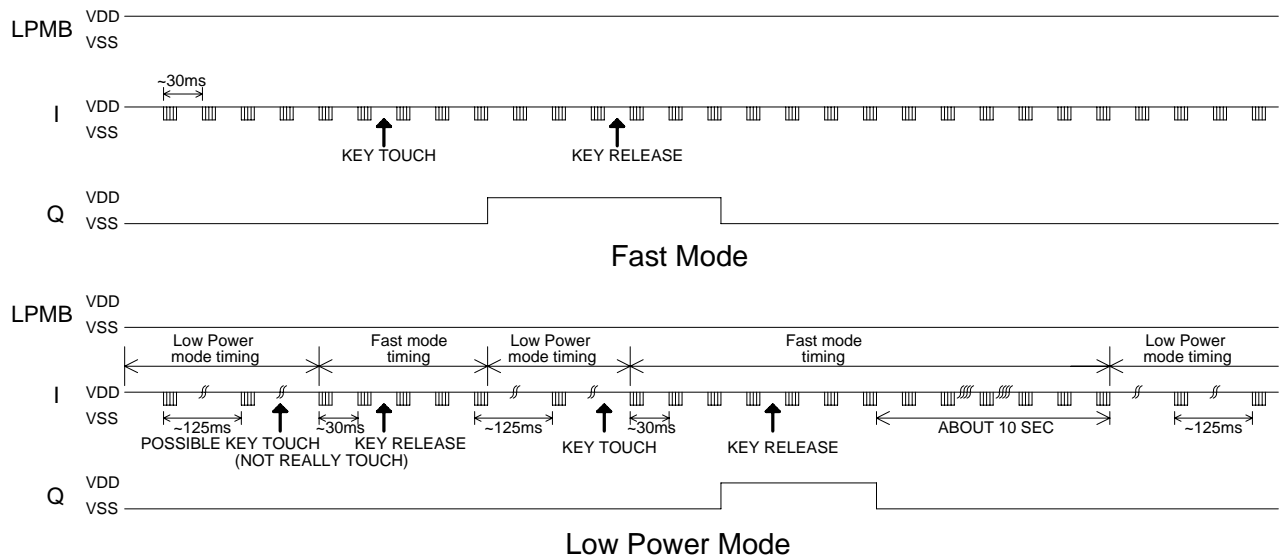
LPMB	Option features
1	Fast mode
0	Low Power mode

APPLICATION CIRCUIT
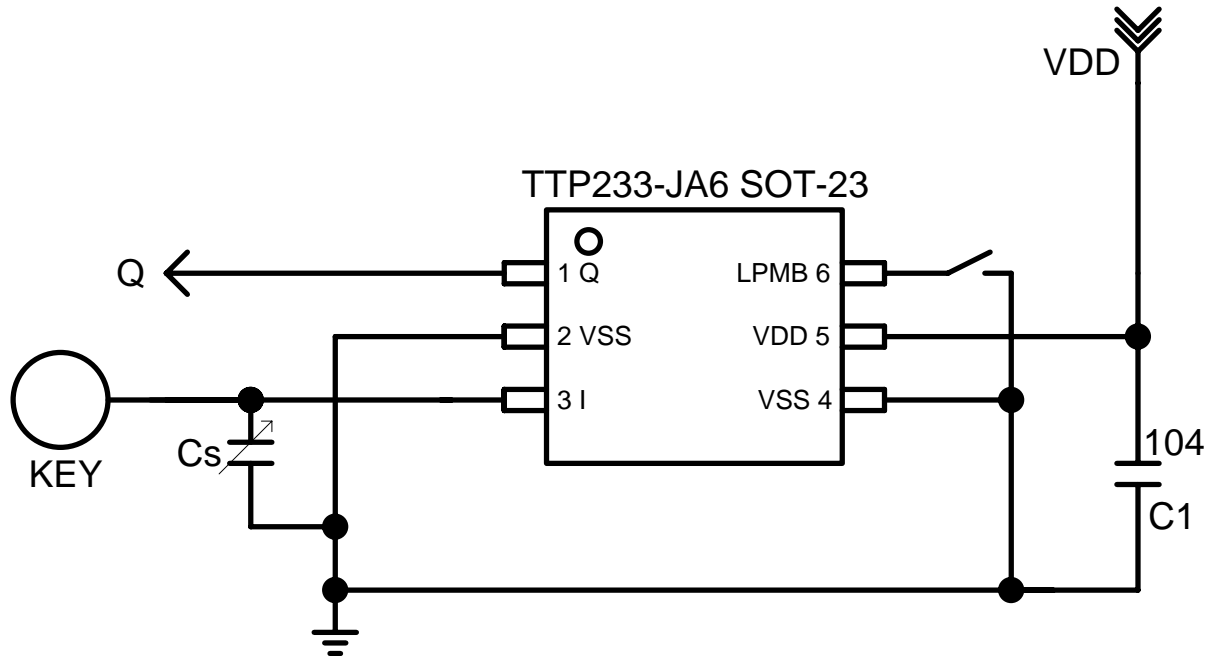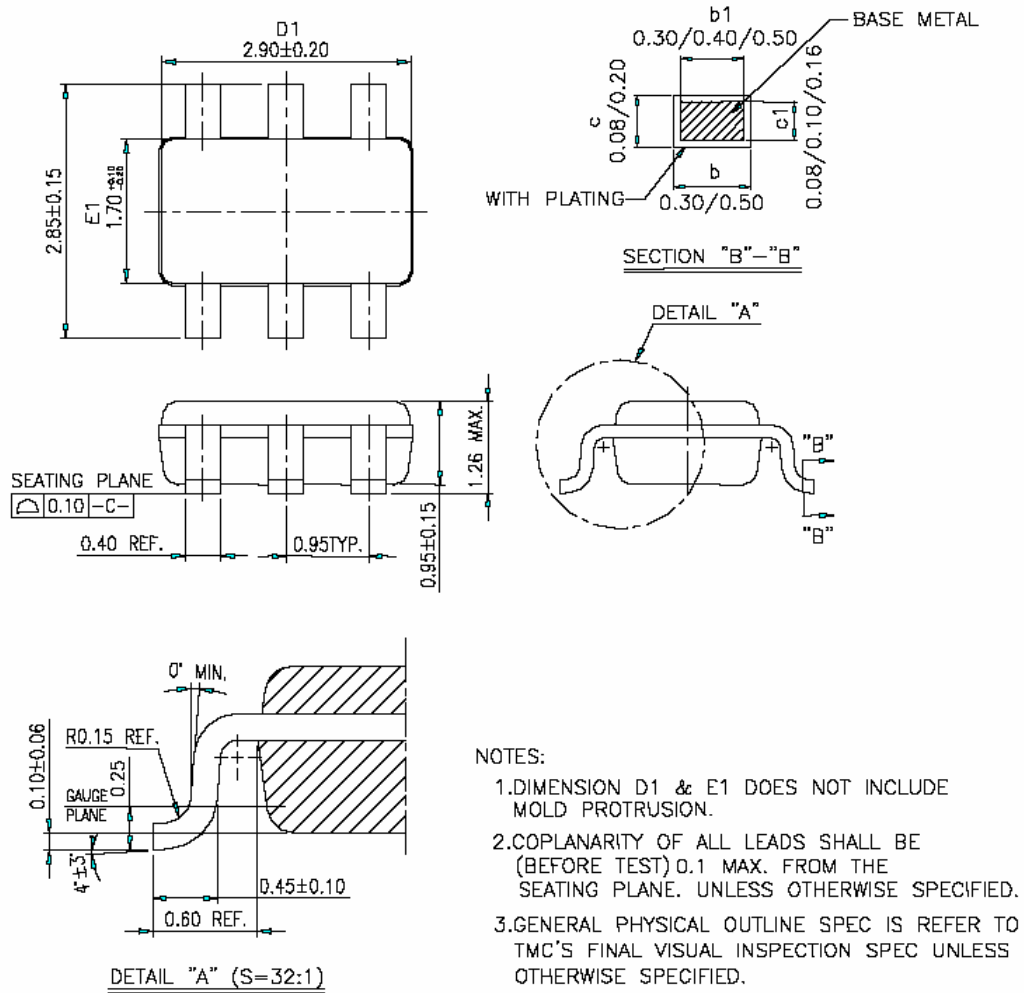

PS：1. On PCB, the length of lines from touch pad to IC pin shorter is better.
    And the lines do not parallel and cross with other lines.
   2. The power supply must be stable. If the supply voltage drift or shift quickly, maybe causing
      sensitivity anomalies or false detections.
   3. The material 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 capacitance Cs can be used to adjust the sensitivity. The value of Cs use smaller, then
      the sensitivity will be better. The sensitivity adjustment must according to the practical
      application on PCB. The range of Cs value is 1~50pF.
   5. 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 .
   6. The sensitivity adjustment capacitors (Cs) 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 Type: SOT-23-6L

Package Outline Dimension

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.

ORDER INFORMATION
a. Package form: TTP233-JA6

REVISE HISTORY
1. 2010/05/26
 -Original version：V_1.0