Shanghai Haili Chuang Microelectronics Co., Ltd.

CST816S data sheet

High-performance self-capacitance touch chip

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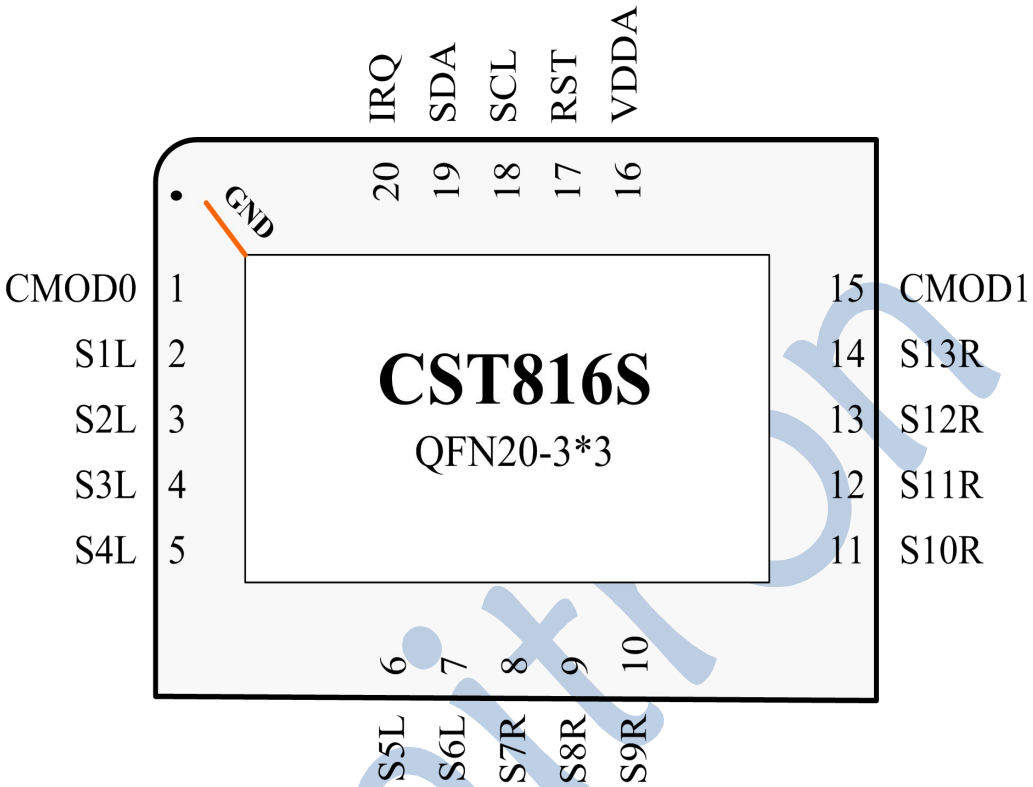
1 Overview

CST816S Self-capacitance touch chip, using high-speed MCU Kernel and embedded DSP The circuit, combined with its own fast self-capacitance sensing technology, can widely support a variety of self-capacitance patterns including triangles, and realize single-point gestures and real two-point operations on it, achieving extremely high sensitivity and extreme Low standby power consumption.

2. Chip Features

- Built-in fast self-capacitance detection circuit and high performance DSP Module
  - Support online programming;
  - Built-in watchdog;
  - Multiple button support;
  - Support standby gesture wake-up function;
- Capacitive screen support
  - Support at most 13 Sensing channels;
  - Channel floating/pull-down design support;
  - Module parameters are automatically adjusted;
- Performance
  - Refresh rate> 100Hz ;
  - Single-point gesture and real two-point operation;
  - Typical power consumption in dynamic mode< 3.0mA ;
  - Typical power consumption in monitor mode< 100uA ;
  - Typical power consumption in standby mode< 30uA ;
  - Typical power consumption in sleep mode< 5uA;
- Communication Interface
  - I2C Master/slave communication interface, rate 10Khz~1Mhz Configurable;
  - compatible 1.8V/3.3V Interface level.
- Power supply
  - Single power supply 2.7V ~ 3.6V , Power ripple <= 50mv ;
  - Except for the power supply bypass capacitor, no other components are required.
- Package type: QFN20 3mm*3mm*0.4mm ;

3. Pinout/Description



name	Description	Remarks
S1~S13	Sensing channel	
VDDA	power supply	2.7V~3.6V , Then 2.2uF~ 10uF capacitance
CMOD0/CMOD1	Stabilizing capacitor	Pick up 1nF~10nF Stabilizing capacitor
IRQ	Interrupt output	Optional rising/falling edge
SCL/SDA	I2C	Optional internal pull-up/open drain mode
RST	Reset input	Low effective, can be suspended

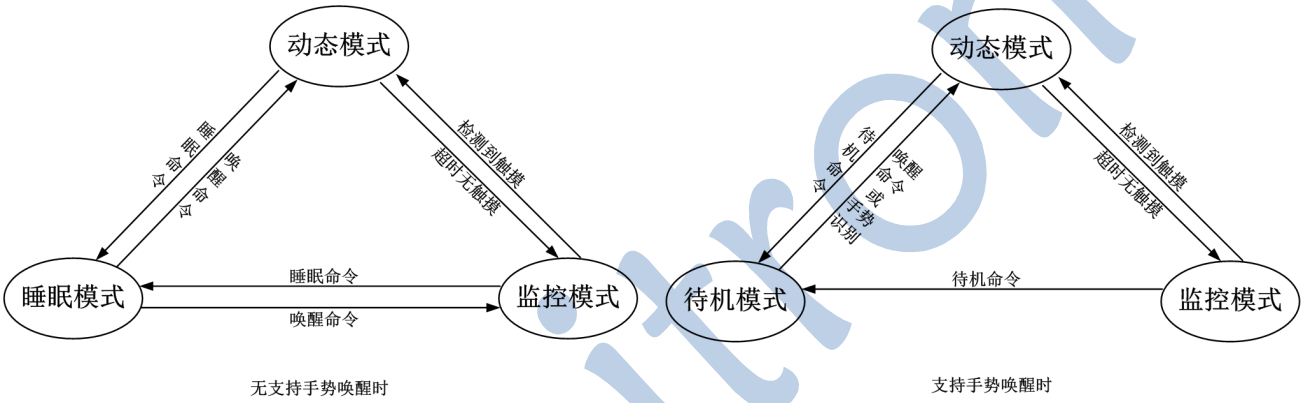
Remarks:

1. CMOD0/CMOD1 Must be connected to a voltage stabilizing capacitor, the size 1nF ~ 10nF;

4. Function description

CST816S The self-capacitance touch chip, through its built-in fast self-capacitance sensing module, does not require any external devices (except for circuit bypass capacitors) Outside), you can achieve single-point gestures and real two-point functions on patterns such as triangles; while achieving rapid response, it has extremely excellent Anti-noise, waterproof, low power consumption performance.

4.1 Working mode



- Dynamic mode

  When there are frequent touch operations, it is in this mode; in this mode, the touch chip quickly performs self-capacitance scanning on the touch screen and timely inspection Measure the touch and report to the host.

- Monitoring mode

  When there is no touch action on the touch screen overtime, the chip will automatically switch to the monitoring mode; in this mode, the touch chip will pass through the monitor at a lower frequency Content scanning detects possible touch actions, and quickly switches to dynamic mode;

- Standby mode

  After receiving the standby command, it is in this mode; in this mode, the touch chip scans the touch screen at a lower frequency and wakes it up. After the gesture, enter the dynamic mode and pass IRQ The pin wakes up the host; it can also be switched to dynamic mode by the wake-up command.

- Sleep mode

  After receiving the sleep command, it is in this mode; in this mode, the touch chip is in a deep sleep state to save power consumption to the greatest extent. Can switch to dynamic mode by wake-up command.

4.2 Channel/Node Configuration

CST816S Self-capacitance touch chip can provide up to 13 Two sensing channels, each channel can support self-capacitance scanning without external devices. The range of self-capacitance supported by each channel: 1pF ~ 400pF

4.3 Power-on/Reset

The built-in power-on reset module will keep the chip in the reset state until the voltage is normal. When the voltage is lower than a certain threshold, the chip will also be reset;

When the external reset pin RST *n* When it is low, the entire chip will be reset. This pin has a built-in pull-up resistor and RC Filtering, the pin can be left floating; the chip has a built-in watchdog to ensure that when an abnormal situation occurs, the chip can still return to normal operation within the specified time.

4.5 Low power mode

CST816S The touch chip supports the following low power consumption methods:

- Sleep mode: After the host sends a sleep command to the chip, the chip will immediately enter the deep sleep mode to achieve the lowest power consumption; the wake-up command is received After the order, the chip will wake up and enter the dynamic working mode;
- Monitoring mode: In dynamic working mode, when there is no touch over time, the chip will automatically enter the monitoring mode; in this mode, the chip will operate at a lower frequency Wake up periodically to detect a valid touch, if a touch is detected, it will immediately enter the dynamic working mode to provide the best performance, otherwise continue to sleep And wait for the next wakeup;
- Standby mode: In this mode, the chip is always at a lower frequency and scans to the minimum to match the predefined wake-up gesture;

4.6 I2C communication

The chip supports standard I2C Communication protocol standard, can be realized 10Khz~1Mhz The configurable communication rate. Two I2C Pin SCL with SDA In addition to supporting open drain mode, it also supports internal pull-up mode for flexible selection.

4.7 Interrupt mode

The touch chip only passes when it detects a valid touch and needs to report it to the host IRQ The pin informs the host to read valid data to improve efficiency and reduce CPU burden;

The interrupt edge can be configured as a rising edge or a falling edge as required;

When matching predefined gestures in standby mode, IRQ The pin is also used to wake up the host.

4.8 Parameter setting

Please refer to this part CST8xx Touch development kit help documentation.

5. Application design specifications

5.1 Power decoupling capacitor

Generally on the chip VDD with VSS Parallel to one end 0.1uF with 10uF The ceramic capacitor can play the role of decoupling and bypass. The decoupling capacitor should be placed as close to the chip as possible to minimize the current loop area.

5.2 COMD filter capacitor

Use at least filter capacitor 10% Precision NPO/COG Material capacitor, the selection range of its capacitance value is 1nF To 10nF Between, the general choice 1.5nF . The specific optimal value is related to the corresponding body capacitance. COMD The filter capacitor must be placed close to the corresponding pin of the chip, the shorter the trace between it and the chip The better.

5.3 Waterproof precautions

Sensor There should not be a large area around the wiring and the large area must be broken.

5.4 ESD precautions

FPC The design will directly affect ESD When designing, you must pay attention to the following items:

- FPC Try to use magnetic film for full shielding, and the magnetic film must be grounded.
- FPC versus Sensor Keep the pressure and position as far away as possible from the gap of the assembled mechanism to reduce ESD Impact.
- The power access point can be considered to increase TVS Pipe to the ground to enhance resistance ESD Interference performance.

5.5 Notes on electromagnetic interference

Sensor The wiring must be separated from the wiring that may cause interference, such as power wiring, audio wiring, LCD Drive line, Bluetooth antenna, RF Antenna etc. special, TP When adopting a full-fit design, it may be affected by LCD Interference, at this time TP The parameters need special debugging.

5.6 Ground wire

The high-precision detection circuit inside the touch chip is sensitive to the ground wire. If possible, the user should use a star ground to isolate the noise of other chips.

At the same time, as much as possible to string into the ground to enhance the anti-interference ability.

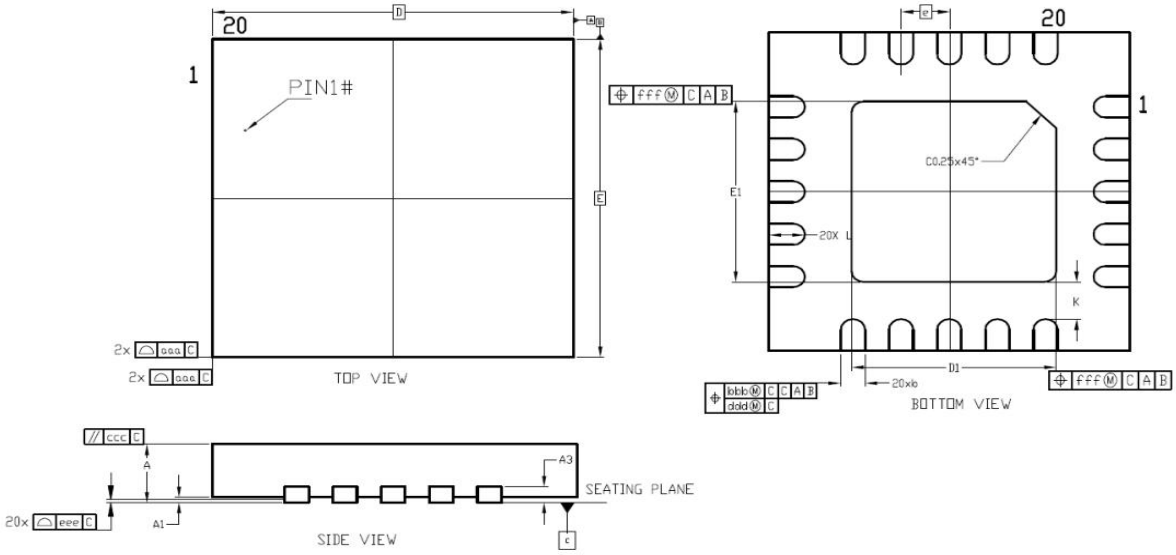
If star grounding is difficult to achieve, users also need to separate the ground of the high-current device from the ground of the touch chip as much as possible.

6. Electrical characteristics

Ambient temperature 25 •C, VDDA=3.3V.

parameter	Minimum	Typical value	Max	unit
Operating Voltage	2.7	3.3	3.6	V
Operating temperature	-40	+ 25	+ 85	•C
storage temperature	-60	-	+ 150	•C
Working humidity	-	-	95	%
Power ripple	-	-	50	mV
Working current (dynamic mode)	-	3.0	-	mA
Working current (monitoring mode)	-	100	-	uA
Working current (standby mode)	-	30	-	uA
Working current (sleep mode)	-	5	-	uA

7. Product packaging



QFN20 外形图

DIM / SYMBOL	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
A1	0	0.02	0.05
A3	–	0.152 REF	–
b	0.15	0.20	0.25
D	3.00BSC		
E	3.00BSC		
D2	1.60	1.70	1.80
E2	1.60	1.70	1.80
e	0.40BSC		
L	0.25	0.30	0.35
K	0.20	–	–
aaa	0.10		
bbb	0.07		
ccc	0.10		
ddd	0.05		
eee	0.08		
fff	0.10		

QFN20 外形尺寸

8. Reference circuit