# GT911

## 5-point SOC Touch Solution for Phone

## Rev. 04 ——2013.08.27

====== Announcement of exemption======

# Contents

1. Overview ..... 3
2. Features ..... 3
3. Chip Diagram ..... 4
4. Pin Definition ..... 5
5. Sensor Development ..... 6
5.1. Arrangement of Sensing Channels ..... 6
5.2. Arrangement of Driving Channels ..... 6
5.3. Design Specification of ITO Sensor ..... 6
6. $I^2C$ Communication ..... 8
6.1. $I^2C$ Communication ..... 8
a) Data Transmission ..... 9
b) Write Data to GT911 ..... 10
c) Read Data from GT911 ..... 10
6.2. Register Information of GT911 ..... 11
a) Real Time Order ..... 11
b) Configuration Information ..... 11
c) Coordinates Information ..... 16
7. Function Mode ..... 18
7.1. Working Mode ..... 18
a) Normal Mode ..... 18
b) Green Mode ..... 18
c) Sleep Mode ..... 18
7.2. Pulse Calling ..... 19
7.3. Sleep Mode ..... 19
7.4. Parameter Frozen Function ..... 19
7.5. Frequency Hopping Function ..... 19
7.6. Automatic Calibration ..... 20
a) Initialization Calibration ..... 20
b) Automatic Temperature Drift ..... 20
8. Reference Circuit Diagram ..... 21
9. Electrical Characteristics ..... 22
9.1. Absolute Operation Rating ..... 22
9.2. Operating Characteristic ..... 22
9.3. AC Characteristic ..... 22
9.4. DC Characteristic ..... 22
9.5. Reflow Condition ..... 错误!未定义书签。
10. Package ..... 23
11. Document History Record ..... 24
12. Contact Information ..... 25

# 1. Overview

Based on Goodix 3rd generation Projected-Capacitive touch technology, GT911 has a sensing network with 26 driving channels and 14 sensing channels, built-in analog amplifier circuit, digital operation module and high-performance MPU, transfer the touch information through $I^2C$.

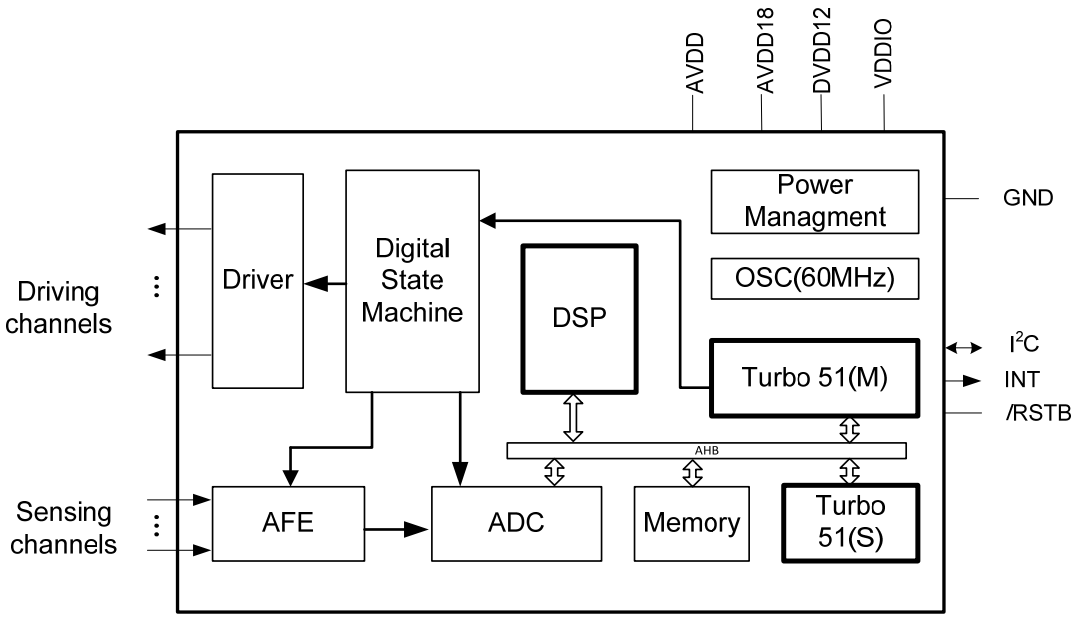
GT911 can support for 5 touch points in fast response time and low consumption, which is very suitable for mobile phone.

# 2. Features

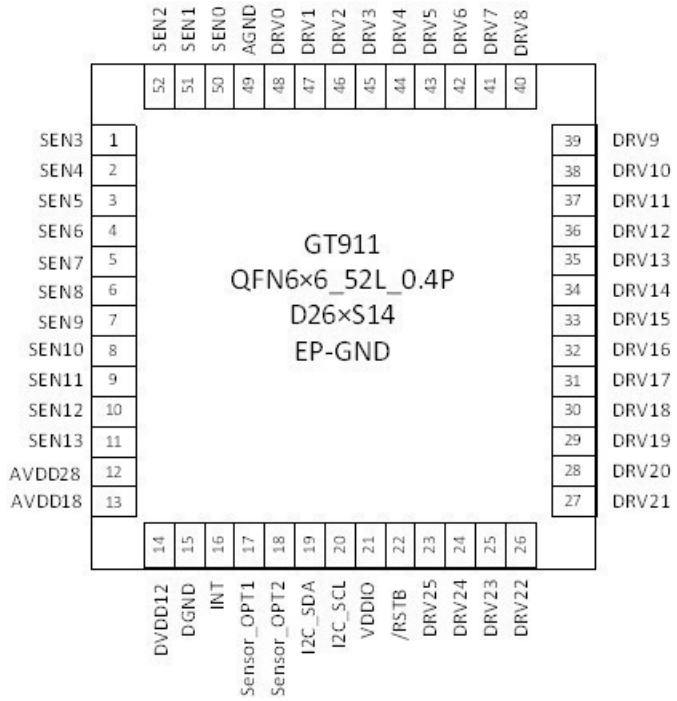
- ✧ Built-in circuit and high performance MPU
  - ➢ Touch report rate: 100Hz
  - ➢ 5 point touch, Touch point output in coordinates type
  - ➢ Unified firmware version for different Touch-panel size
  - ➢ Single power supply**,** Built in 1.8V LDO
  - ➢ Flash craft, support online burning
- ✧ Touch screen sensor
  - ➢ Channel: 26(driving)*14(sensing)
  - ➢ Support size: 7”~8”
  - ➢ Support for ITO Glass and ITO Film
  - ➢ OGS/SITO without shielding layer available
  - ➢ Cover lens thickness requirement: 0.7mm≦glass≦2mm, 0.5mm≦PET ≦1.2mm
  - ➢ Built in frequency hopping
- ✧ Environmental applicable performance
  - ➢ Initialized automatic calibration
  - ➢ Automatic temperature drift compensation
  - ➢ Operating temperature: -40℃~+85℃, humidity: ≦95%RH
  - ➢ Storage temperature: -60℃~+125℃, humidity: ≦95%RH
- ✧ Communication interface
  - ➢ Standard $I^2C$ communication protocol
  - ➢ Working in $I^2C$ Slave mode
  - ➢ Support 1.8V~3.3V interface level
- ✧ Wake-up time
  - ➢ Green mode: <48ms
  - ➢ Sleep mode: <200ms
  - ➢ Initialization: <200ms

- Power supply:
  - Single power: 2.8V~3.3V
- Power ripple:
  - Vpp≦50mV
- Packaging:
  - GT911: 52pins，6mm*6mm QFN_0.4P
- Development supporting tools
  - Touch-panel module's performance analysis tool
  - Parameter detector & configuration capture of touch panel
  - Q/C tools for mass production
  - Developing guide & reference code supporting

# 3. Chip Diagram



# 4. Pin Definition



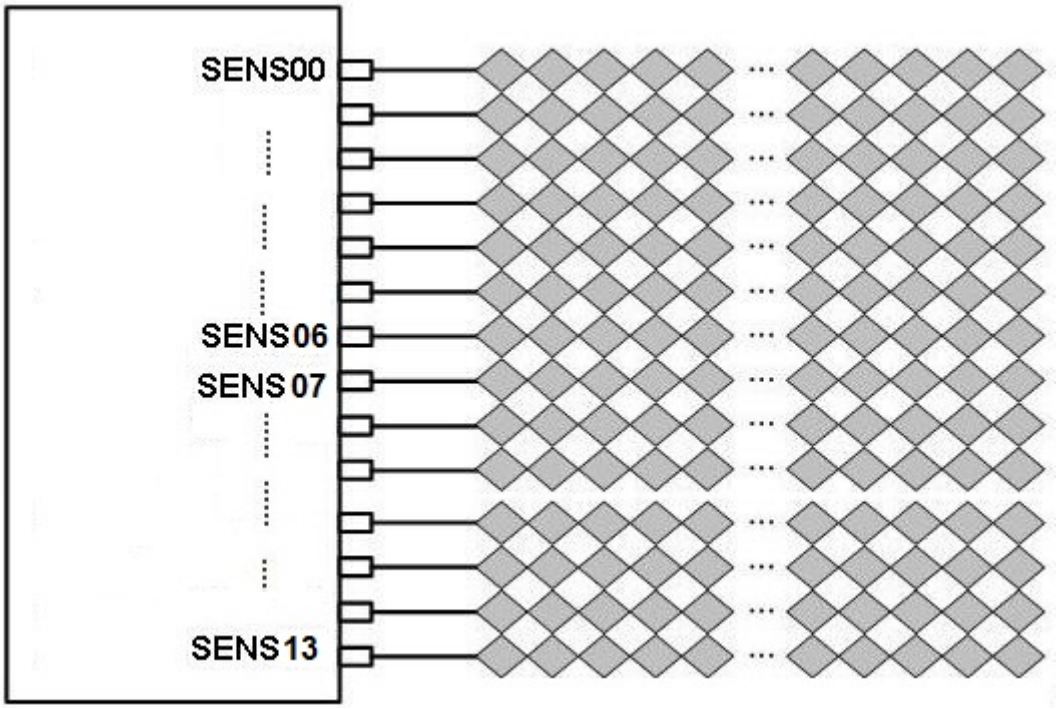

| Pin No. | Name | Description | Remark |
|---|---|---|---|
| 1~11 | SEN3~SEN13 | Sensing channels | |
| 12 | AVDD28 | Analog VDD 2.8V | 2.2uF to GND |
| 13 | AVDD18 | | 2.2uF to GND |
| 14 | DVDD12 | | 2.2uF to GND |
| 15 | DGND | Digital ground | |
| 16 | INT | Interrupt | |
| 17 | Sensor_OPT1 | Sensor option pin1 | |
| 18 | Sensor_OPT2 | Sensor option pin2 | External pull-down res. |
| 19 | $I^2C$_SDA | $I^2C$_data | |
| 20 | $I^2C$_SCL | $I^2C$_clock | |
| 21 | VDDIO | VDD of GPIO | 2.2uF to GND<br>1. floating: 1.8V<br>2. to AVDD: AVDD |
| 22 | /RSTB | Reset | external pull-up, low valid |
| 23~48 | DRV25~DRV0 | Driving channels | |
| 49 | AGND | Analog ground | |
| 50~52 | SEN0~SEN2 | Sensing channels | |

# 5. Sensor Development

## 5.1. Arrangement of Sensing Channels

GT911 has 14 sensing pins: SEN0~SEN13, which are directly connected to ITO sensors. Please use “Channel Selector” to select channel & arrange the channel sequence when ITO channel is less than detection channel of the chip.

- example: Layout all the ITO races on the same side, connected in the sequence from 0 to 13 or 13 to 0:




## 5.2. Arrangement of Driving Channels

GT911 has 26 driving channels in total, which are directly connected with 26 ITO sensors. Please use “Channel Selector” to select channel & arrange the channel sequence when ITO channel is less than detection channel of the chip.

After the layout of driving channels, relevant registers of GT911 shall be configured to ensure logic position relations consistent with physical position relations of driving channels.

5.3. Design Specification of ITO Sensor

| Parameter | DITO limits | SITO limits |
|---|---|---|

| | | |
|---|---|---|
| **Impedance of driving channel race** | 3k Ω | 3k Ω |
| **Impedance of driving channel** | 10k Ω | 10k Ω |
| **Impedance of sensing channel race** | 10k Ω | 10k Ω |
| **Impedance of sensing channel** | 40k Ω | 10k Ω |
| **Capacitor of node** | 4pF | 4pF |

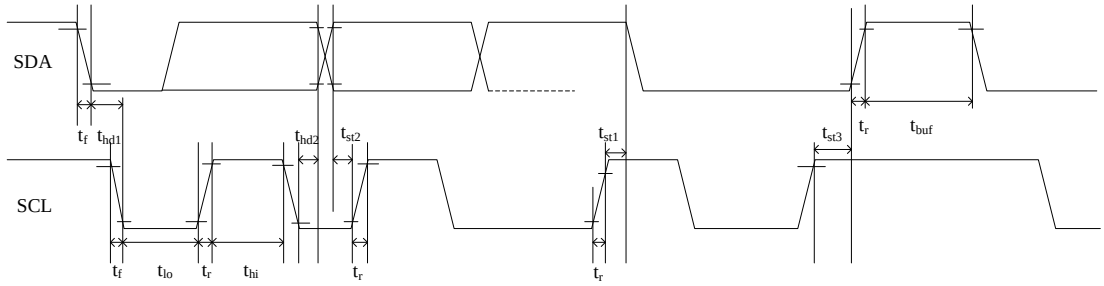
In the course of actual TP module production, driving channels and sensing channels are made with ITO or other invisible conductive material, and the volatility of impedance is relatively small. When the channel races are used with metallic material, some races may be oxidized and their impedance will become larger due to process control or other reasons, the impedance will be different; when the wires are used with ITO materials, though the races in all channels will be maintained consistent by virtue of matching length and width in design, there still be some difference. In order to guarantee data consistency and evenness in the whole panel, the wiring impedance shall meet the requirements as above table.

Driver and sense traces adjacent and parallel to,the need to insert between the ground and the ground trace width of at least twice the width of the channel,the minimum of not less than 0.2mm.

# 6. I²C Communication

## 6.1. I²C Communication

GT911 provides standard I²C interface for communication. In the system, GT911 always works in slave mode, all communications are initiated by master, and the baud rate can be up to 400K bps. The definition of I²C timing is as following:




**Test condition1: 1.8V communication interface, 400Kbps, pull up resistor is 2K ohm**

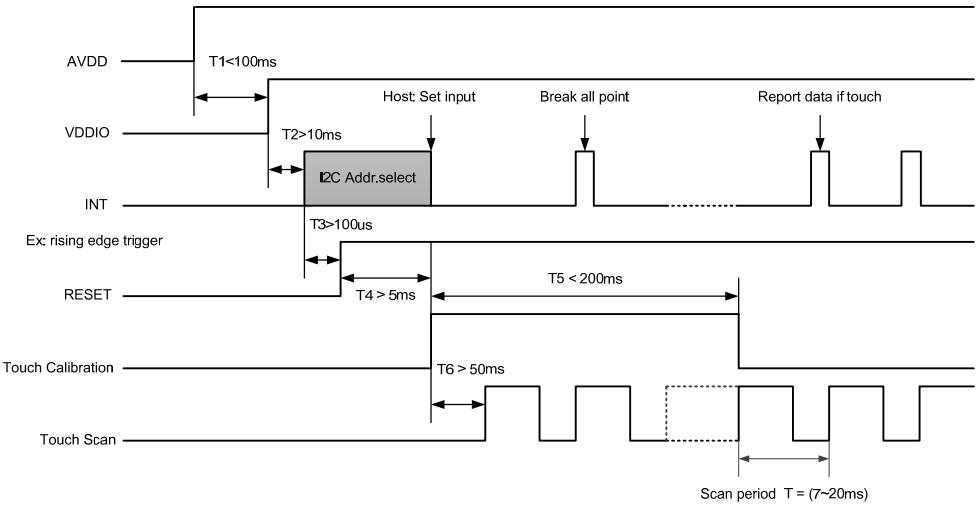
| Parameter | Symbol | MIN. | Max. | Unit |
|---|---|---|---|---|
| SCL low period | $t_{lo}$ | 1.3 | - | us |
| SCL high period | $t_{hi}$ | 0.6 | - | us |
| SCL setup time for START condition | $t_{st1}$ | 0.6 | - | us |
| SCL setup time for STOP condition | $t_{st3}$ | 0.6 | - | us |
| SCL hold time for START condition | $t_{hd1}$ | 0.6 | - | us |
| SDA setup time | $t_{st2}$ | 0.1 | - | us |
| SDA hold time | $t_{hd2}$ | 0 | - | us |

**Test condition2: 3.3V communication interface, 400Kbps, pull up resistor is 2K ohm**

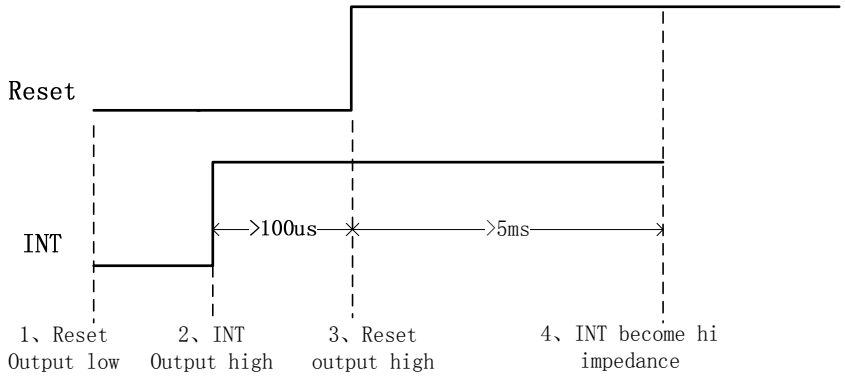
| Parameter | Symbol | MIN. | Max. | Unit |
|---|---|---|---|---|
| SCL low period | $t_{lo}$ | 1.3 | - | us |
| SCL high period | $t_{hi}$ | 0.6 | - | us |
| SCL setup time for START condition | $t_{st1}$ | 0.6 | - | us |
| SCL setup time for STOP condition | $t_{st3}$ | 0.6 | - | us |
| SCL hold time for START condition | $t_{hd1}$ | 0.6 | - | us |
| SDA setup time | $t_{st2}$ | 0.1 | - | us |
| SDA hold time | $t_{hd2}$ | 0 | - | us |

GT911 has 2 sets of slave address 0xBA/0xBB & 0x28/29. Master can control Reset & INT pin to configure the slave address in power on initial state like following:

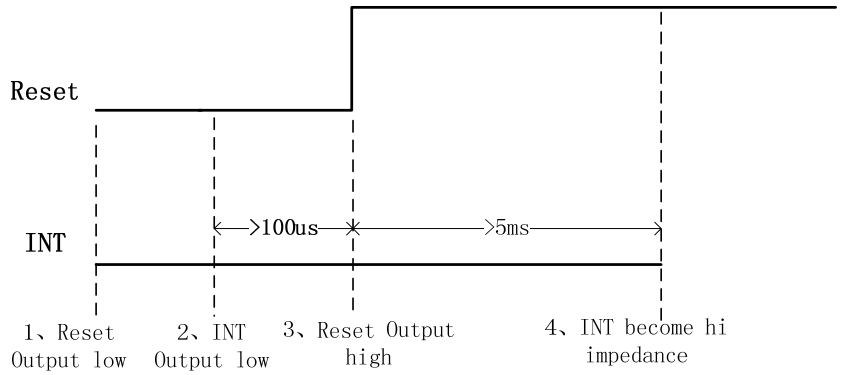
**Power on diagram:**




**Timing of setting slave address to 0x28/0x29:**




**Timing of setting slave address to 0xBA/0xBB:**




## a) Data Transmission

(ex: slave address is 0xBA/0xBB)

Communication is always initiated by master, A high-to-low transition of SDA with SCL high is a start condition.

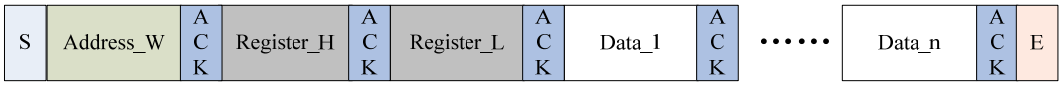
All addressing signal are serially transmitted to and from on bus in 8-bit word. GT911 sends a “0” to acknowledge when the addressing word is 0xBA/BB (or 0x28/0x29 ). This happens during the ninth clock cycle. If the slave address is not matched, GT911 will stay in idle state.

The data words are serially transmitted to and from in 9-bit formation: 8-bit data + 1-bit ACK or NACK sent by GT911. Data changes during SCL low periods & keeps valid during SCL high.

A low-to-high transition of SDA with SCL high is a stop condition.

## b) Write Data to GT911

(ex: slave address is 0xBA/0xBB)




**Write operations**

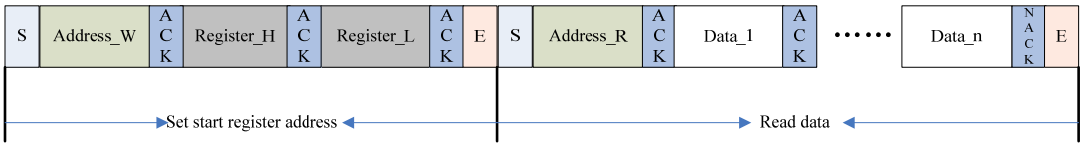
Please check the above figure, master start the communication first, and then sends device address 0XBA preparing for a write operation.

After receiving ACK from GT911, master sends out 16-bit register address, and then the data word in 8-bit, which is going to be wrote into GT911.

The address pointer of GT911 will automatically increase one after one byte writing, so master can sequentially write in one operation. When operation finished, master stop the communication.

## c) Read Data from GT911

(ex: slave address is 0xBA/0xBB)




**Read operations**

Please check the above figure, master start the communication first, and then sends device address 0xBA for a write operation.

After receiving ACK from GT911, master sends out 16-bit register address, to set the address pointer of GT911. After receiving ACK, master produce start signal once again & send device address 0xBB , then read data word from GT911 in 8-bit.

GT911 also supports sequential read operation, and the default setting is sequential read mode.

Master shall send out ACK after every byte reading successfully but NACK after the last one. Then sends stop signal to finish the communication.

## 6.2. Register Information of GT911

### a) Real Time Order

(Write Only)

| Addr | Name | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|---|---|---|---|---|---|---|---|---|---|
| 0x8040 | Command | 0：read coordinate 1：read diff data or raw data 2：software reset3:baseline update 4: baseline calibration 5: screen off 3&4 are still internal test | | | | | | | |

### b) Configuration Information

(R/W)

| | Config Data | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|---|---|---|---|---|---|---|---|---|---|
| 0x8047 | Config_ Version | Version of the configuration | | | | | | | |
| 0x8048 | X Output Max (Low Byte) | Resolution of X axis | | | | | | | |
| 0x8049 | X Output Max (High Byte) | | | | | | | | |
| 0x804A | Y Output Max (Low Byte) | Resolution of Y axis | | | | | | | |
| 0x804B | Y Output Max (High Byte) | | | | | | | | |
| 0x804C | Touch Number | Reserved | | | | Touch number：1~5 | | | |
| 0x804D | Module_ Switch1 | Reserved | | Stretch_rank | | X2Y | Reserved | INT trigger method 00：rising edge trigger 01：falling edge trigger 02：low level enquiry 03：high level enquiry | |
| 0x804E | Module_ switch2 | Reserved | | | | | | | |
| 0x804F | Shake_Count | Reserved | | | | Finger shake count | | | |
| 0x8050 | Filter | First_Filter | | Normal_Filter (filtering value of original coordinate | | | | | |

| | | | |
|---|---|---|---|
| | | | window, coefficiency is 1) |
| 0x8051 | Large_Touch | Number of touch in large area | |
| 0x8052 | Noise_ Reduction | Reserved | Value of noise elimination (coefficient is 1, 0~15) |
| 0x8053 | Screen_ Touch_Level | Threshold of touch grow out of nothing | |
| 0x8054 | Screen_ Leave_Level | Threshold of touch grow out of nothing | |
| 0x8055 | Low_Power_ Control | Reserved | Time to low power consumption (0~15s) |
| 0x8056 | Refresh_Rate | Reserved | Coordinate report rate (Cycle: 5+N ms) |
| 0x8057 | x_threshold | Reserved | |
| 0x8058 | y_threshold | | |
| 0x8059 | X_Speed_Limit | Reserved | |
| 0x805A | Y_Speed_Limit | | |
| 0x805B | Space | Blank area of boarder-top (coefficient is 32) | Blank area of Boarder-bottom (coefficient is 32) |
| 0x805C | | Blank area of boarder-left (coefficient is 32) | Blank area of Boarder-right (coefficient is 32) |
| 0x805D | Stretch_Rate | Reserved | Level of weak stretch (Stretch X/16 Pitch) （beta version is valid，published version is not） |
| 0x805E | Stretch_R0 | Interval 1 coefficient | |
| 0x805F | Stretch_R1 | Interval 2 coefficient | |
| 0x8060 | Stretch_R2 | Interval 3 coefficient | |
| 0x8061 | Stretch_RM | All intervals base number | |
| 0x8062 | Drv_GroupA_ Num | All_Driving / Reserved | Driver_Group_A_number |
| 0x8063 | Drv_GroupB_ Num | Reserved | Driver_Group_B_number |
| 0x8064 | Sensor_Num | Sensor_Group_B_Number | Sensor_Group_A_Number |
| 0x8065 | FreqA_factor | Driver frequency double frequency coefficient of Driver group A GroupA_Frequence = Multiplier factor * baseband | |
| 0x8066 | FreqB_factor | Driver frequency double frequency coefficient of Driver group B GroupB_Frequence = Multiplier factor * baseband | |
| 0x8067 | Pannel_ BitFreqL | Baseband of Driver group A\B (1526HZ<baseband<14600Hz) | |
| 0x8068 | Pannel_ BitFreqH | | |

| | | | | | |
|---|---|---|---|---|---|
| 0x8069 | Pannel_Sensor_TimeL | Time interval of the neibouring two driving signal (Unit: us), Reserved. | | | |
| 0x806A | Pannel_Sensor_TimeH | | | | |
| 0x806B | Pannel_Tx_Gain | Reserved | | Pannel_Drv_output_R<br>4 gears | Pannel_DAC_Gain<br>0:Gain maximum<br>7: Gain minimum |
| 0x806C | Pannel_Rx_Gain | Pannel_PGA_C | Pannel_PGA_R | Pannel_Rx_Vcmi<br>(4 gears) | Pannel_PGA_Gain<br>(8 gears) |
| 0x806D | Pannel_Dump_Shift | Reserved | | Magnification coefficient of original value (The Nth power of 2) | |
| 0x806E | Drv_Frame_Control | Reserved | SubFrame_DrvNum | | Repeat_Num |
| 0x806F | NC | Reserved | | | |
| 0x8070 | NC | Reserved | | | |
| 0x8071 | NC | Reserved | | | |
| 0x8072 | NC | Reserved | | | |
| 0x8073 | NC | Reserved | | | |
| 0x8074 | NC | Reserved | | | |
| 0x8075 | NC | Reserved | | | |
| 0x8076 | NC | Reserved | | | |
| 0x8077 | NC | Reserved | | | |
| 0x8078 | NC | Reserved | | | |
| 0x8079 | NC | Reserved | | | |
| 0x807A | Freq_Hopping_Start | Frequency hopping start frequency (Unit: 2KHz, 50 means 100KHz ) | | | |
| 0x807B | Freq_Hopping_End | Frequency hopping stop frequency (Unit: 2KHz, 150 means 300KHz ) | | | |
| 0x807C | Noise_Detect_Times | Detect_Stay_Times | Detect_Confirm_Times | | |
| 0x807D | Hopping_Flag | Hopping_En | Reserved | Detect_Time_Out | |

| | | | |
|---|---|---|---|
| 0x807E | Hoppging_ Threshold | Large_Noise_Threshold | Hopping_Hit_Threshold |
| 0x807F | Noise_ Threshold | Threshold of noise level | |
| 0x8080 | NC | Reserved | |
| 0x8081 | NC | Reserved | |
| 0x8082 | Hopping_seg1_ BitFreqL | Frequency hopping segment band 1 central frequency (for driver A/B) | |
| 0x8083 | Hopping_seg1_ BitFreqH | | |
| 0x8084 | Hopping_seg1_ Factor | Frequency hopping segment 1 central frequency coefficient | |
| 0x8085 | Hopping_seg2_ BitFreqL | Frequency hopping segment band 2 central frequency (for driver A/B) | |
| 0x8086 | Hopping_seg2_ BitFreqH | | |
| 0x8087 | Hopping_seg2_ Factor | Frequency hopping segment 2 central frequency coefficient | |
| 0x8088 | Hopping_seg3_ BitFreqL | Frequency hopping segment band 3 central frequency (for driver A/B) | |
| 0x8089 | Hopping_seg3_ BitFreqH | | |
| 0x808A | Hopping_seg3_ Factor | Frequency hopping segment 3 central frequency coefficient | |
| 0x808B | Hopping_seg4_ BitFreqL | Frequency hopping segment band 4 central frequency (for driver A/B) | |
| 0x808C | Hopping_seg4_ BitFreqH | | |
| 0x808D | Hopping_seg4_ Factor | Frequency hopping segment 4 central frequency coefficient | |
| 0x808E | Hopping_seg5_ BitFreqL | Frequency hopping segment band 5 central frequency (for driver A/B) | |
| 0x808F | Hopping_seg5_ BitFreqH | | |
| 0x8090 | Hopping_seg5_ Factor | Frequency hopping segment 5 central frequency coefficient | |
| 0x8091 | NC | Reserved | |
| 0x8092 | NC | Reserved | |
| 0x8093 | Key 1 | Key 1 Position: 0-255 valid (0 means no touch, it means independent touch key when 4 of the keys are 8 multiples, Reserved | |
| 0x8094 | Key 2 | Key 2 position, Reserved | |

| | | | |
|---|---|---|---|
| 0x8095 | Key 3 | Key 3 position, Reserved | |
| 0x8096 | Key 4 | Key 4 position, Reserved | |
| 0x8097 | Key_Area | Time limit for long press(1~16 s) , Reserved | Touch valid interval setting: 0-15 valid, Reserved |
| 0x8098 | Key_Touch_Level | Key threshold of touch key, Reserved | |
| 0x8099 | Key_Leave_Level | Key threshold of touch key, Reserved | |
| 0x809A | Key_Sens | KeySens_1(sensitivity coefficient of key 1, same below) , Reserved | KeySens_2, Reserved |
| 0x809B | Key_Sens | KeySens_3, Reserved | KeySens_4, Reserved |
| 0x809C | Key_Restrain | Finger from screen left after inhibition of key time(Unit:100ms,0 means 600ms) , Reserved | The independent button pro key inhibition parameters, Reserved |
| 0x809D | NC | Reserved | |
| 0x809E | NC | Reserved | |
| 0x809F | NC | Reserved | |
| 0x80A0 | NC | Reserved | |
| 0x80A1 | NC | Reserved | |
| 0x80A2 | NC | Reserved | |
| 0x80A3 | NC | Reserved | |
| 0x80A4 | NC | Reserved | |
| 0x80A5 | NC | Reserved | |
| 0x80A6 | NC | Reserved | |
| 0x80A7 | NC | Reserved | |
| 0x80A8 | NC | Reserved | |
| 0x80A9 | NC | Reserved | |
| 0x80AA | NC | Reserved | |
| 0x80AB | NC | Reserved | |
| 0x80AC | NC | Reserved | |
| 0x80AD | NC | Reserved | |
| 0x80AE | NC | Reserved | |
| 0x80AF | NC | Reserved | |
| 0x80B0 | NC | Reserved | |
| 0x80B1 | NC | Reserved | |
| 0x80B2 | NC | Reserved | |
| 0x80B3 | NC | Reserved | |
| 0x80B4 | NC | Reserved | |
| 0x80B5 | NC | Reserved | |
| 0x80B6 | NC | Reserved | |
| 0x80B7 | Sensor_CH0~ | ITO Sensor corresponding chip channel number | |

| | | |
|---|---|---|
| ~ 0x80C4 | Sensor_CH13 | |
| 0x80C5 ~ 0x80D4 | NC | Reserved |
| 0x80D5 ~ 0x80EE | Driver_CH0~ Driver_CH25 | ITO Driver corresponding chip channel number |
| 0x80EF ~ 0x80FE | NC | Reserved |
| 0x80FF | Config_Chksum | configuration information verify (the complement number of total byte from 0x8047 to 0x80FE) |
| 0x8100 | Config_Fresh | signal of updated configuration (the host writes) |

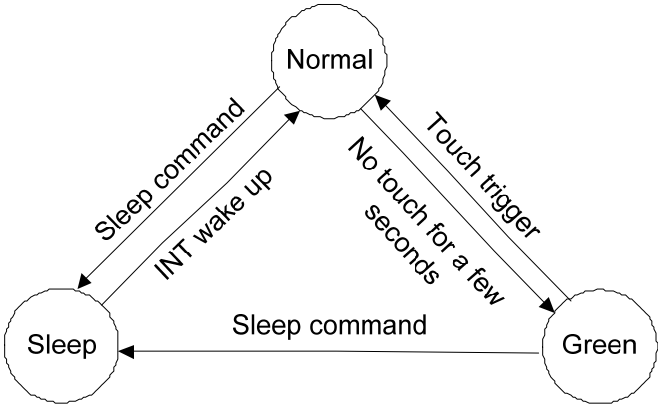
## c) Coordinates Information

| Addr | Access | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|---|---|---|---|---|---|---|---|---|---|
| 0x8140 | R | Product ID ( first byte，ASCII ) | | | | | | | |
| 0x8141 | R | Product ID ( second byte，ASCII ) | | | | | | | |
| 0x8142 | R | Product ID ( third byte，ASCII ) | | | | | | | |
| 0x8143 | R | Product ID ( forth byte，ASCII ) | | | | | | | |
| 0x8144 | R | Firmware version ( HEX.low byte ) | | | | | | | |
| 0x8145 | R | Firmware version ( HEX.high byte ) | | | | | | | |
| 0x8146 | R | x coordinate resolution ( low byte ) | | | | | | | |
| 0x8147 | R | x coordinate resolution ( high byte ) | | | | | | | |
| 0x8148 | R | y coordinate resolution ( low byte ) | | | | | | | |
| 0x8149 | R | y coordinate resolution ( high byte ) | | | | | | | |
| 0x814A | R | Vendor_id ( current module option information ) | | | | | | | |
| 0x814B | R | Reserved | | | | | | | |
| 0x814C | R | Reserved | | | | | | | |
| 0x814D | R | Reserved | | | | | | | |
| 0x814E | R/W | buffer status | | large detect | | Reserved | | | number of touch points |
| 0x814F | R | track id | | | | | | | |
| 0x8150 | R | point 1 x coordinate (low byte) | | | | | | | |
| 0x8151 | R | point 1 x coordinate (high byte) | | | | | | | |
| 0x8152 | R | point 1 y coordinate (low byte) | | | | | | | |
| 0x8153 | R | point 1 y coordinate (high byte) | | | | | | | |
| 0x8154 | R | Point 1 size (low byte) | | | | | | | |
| 0x8155 | R | point 1 size (high byte) | | | | | | | |
| 0x8156 | R | Reserved | | | | | | | |
| 0x8157 | R | track id | | | | | | | |

| | | |
|---|---|---|
| 0x8158 | R | point 2 x coordinate (low byte) |
| 0x8159 | R | point 2 x coordinate (high byte) |
| 0x815A | R | point 2 y coordinate (low byte) |
| 0x815B | R | point 2 y coordinate (high byte) |
| 0x815C | R | point 2 size (low byte) |
| 0x815D | R | point 2 size (high byte) |
| 0x815E | R | Reserved |
| 0x815F | R | track id |
| 0x8160 | R | point 3 x coordinate (low byte) |
| 0x8161 | R | point 3 x coordinate (high byte) |
| 0x8162 | R | point 3 y coordinate (low byte) |
| 0x8163 | R | point 3 y coordinate (high byte) |
| 0x8164 | R | point 3 size (low byte) |
| 0x8165 | R | point 3 size (high byte) |
| 0x8166 | R | Reserved |
| 0x8167 | R | track id |
| 0x8168 | R | point 4 x coordinate (low byte) |
| 0x8169 | R | point 4 x coordinate (high byte) |
| 0x816A | R | point 4 y coordinate (low byte) |
| 0x816B | R | point 4 y coordinate (high byte) |
| 0x816C | R | point 4 size (low byte) |
| 0x816D | R | point 4 size (high byte) |
| 0x816E | R | Reserved |
| 0x816F | R | track id |
| 0x8170 | R | point 5 x coordinate (low byte) |
| 0x8171 | R | point 5 x coordinate (high byte) |
| 0x8172 | R | point 5 y coordinate (low byte) |
| 0x8173 | R | point 5 y coordinate (high byte) |
| 0x8174 | R | point 5 size (low byte) |
| 0x8175 | R | point 5 size (high byte) |
| 0x8176 | R | Reserved |
| 0x8177 | R | Reserved |

# 7. Function Mode

## 7.1. Working Mode




### a) Normal Mode

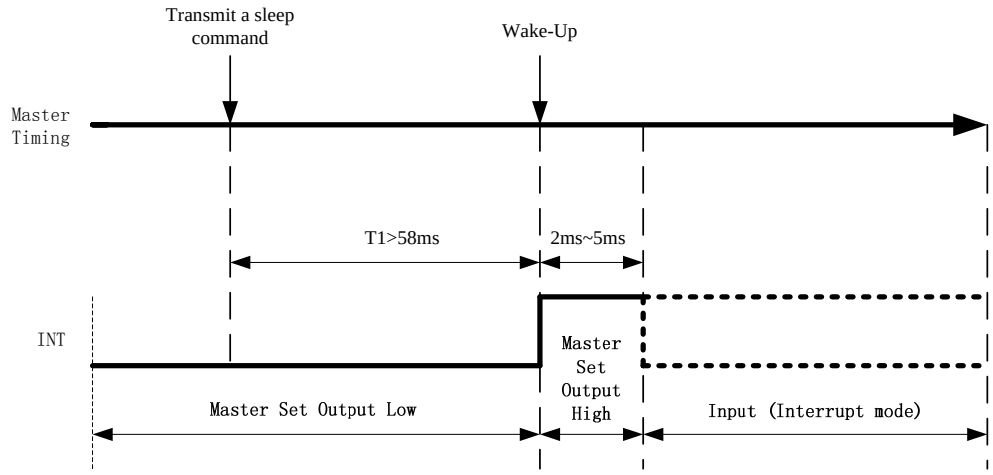
When GT911 is in Normal mode, touch scanning period is about 7ms ~ 10ms depending on the setting. The chip will automatically enter into Green mode if no touch for short time within 0~15s depending on setting and the step is 1s.

### b) Green Mode

In Green mode, the touch scanning cycle is fixed as 40ms. It will automatically enter into Normal mode if any touch is detected.

### c) Sleep Mode

For a lower consumption, Master can ask GT911 to enter Sleep mode through I2C command (before the command, please drive low to INT pin). Drive high to the INT pin of GT911 2~5ms will make GT911 return back to normal mode. I2C off-screen commands issued and the time interval between wake-up requirement greater than 58ms.




## 7.2. Pulse Calling

GT911 will inform master to read coordinate information only when touch event happen, in order to lighten the burden of master CPU. The master CPU will set trigger mode by register ‘INT’. “0” means rising edge trigger, in this mode GT911 will output an rising edge hopping in INT, to inform CPU; “1” means falling edge trigger.

## 7.3. Sleep Mode

When the display is turned off or in any circumstance that operation of touch panel is not necessary, master can set GT911 be in Sleep mode through I2C command. The master can wake up GT911 by outputting high to INT pin & keeping 2-5ms..

## 7.4. Parameter Frozen Function

GT911 support the function of Parameter frozen. When parameter is obtained, parameter can be settled in GT911 through Goodix test tool. If parameter has been frozen, GT911 will not receive the configuration with lower version from master.

## 7.5. Frequency Hopping Function

GT911 has very strong anti-interference hardware, when the driver spectrum of GT911 overlaid with spectrum of noise signal, it can be switch to another frequency by self-adaption frequency hopping mechanism, to avoid interference.

## 7.6. Automatic Calibration

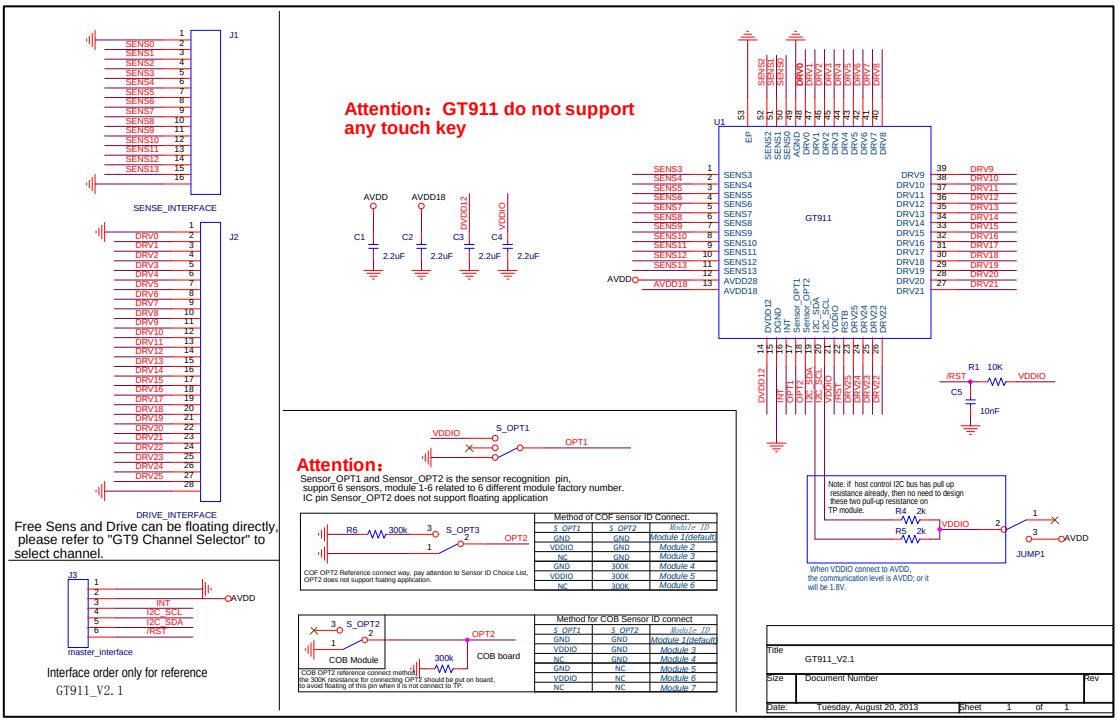
### a) Initialization Calibration

Different temperature, humidity and physical structure will affect the sensor’s baseline. According to environmental situation GT911 will update the baseline automatically in initialized 200ms.

### b) Automatic Temperature Drift

Slow change of temperature, humidity or dust and other environmental factors will also affect the sensor’s baseline. GT911 calculates and analyzes historical data, and compare to the current data variation. Base on this, the baseline will be calibration automatically.

# 8. Reference Circuit Diagram




**Reference Circuit Diagram of GT911**

**Notes:**

1. This circuit only shows basic applications, and may be modified according to actual conditions.
2. The capacitor should be used material of X7R.

# 9. Electrical Characteristics

## 9.1. Absolute Operation Rating

(Temperature 25℃)

| Parameter | Min. | Max. | Unit |
|---|---|---|---|
| Analog power AVDD28 (refer to AGND) | 2.66 | 3.47 | V |
| VDDIO (REF: DGND) | 1.7 | 3.47 | V |
| Input voltage on Digital I/O | -0.3 | 3.47 | V |
| Input voltage on Analog I/O | -0.3 | 3.47 | V |
| Operating temperature | -40 | 85 | ℃ |
| Storage temperature | -60 | 125 | ℃ |
| Welding temperature (10s) | | 300 | ℃ |
| ESD protective voltage（HB Model） | | ±2 | KV |

## 9.2. Operating Characteristic

| Parameter | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| Analog power AVDD28 | 2.8 | - | 3.3 | V |
| VDDIO | 1.8 | - | 3.3 | V |
| Operating temperature | -20 | 25 | 85 | ℃ |

## 9.3. AC Characteristic

(Temperature 25℃, AVDD=2.8V)

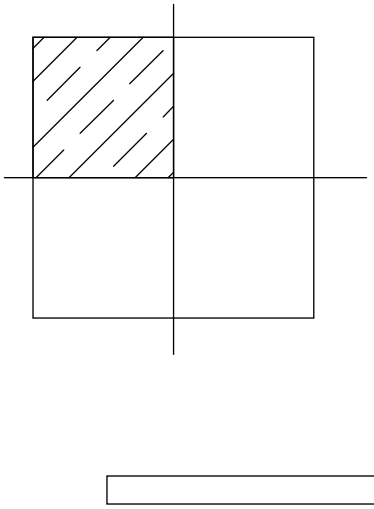
| Parameter | Min. | Typical | Max. | Unit |
|---|---|---|---|---|
| OSC oscillation frequency | 59 | 60 | 61 | MHz |
| I/O output rise time | - | - | 0.5 | ns |
| I/O output fall time | - | - | 0.5 | ns |

## 9.4. DC Characteristic

(Temperature 25℃, VDD=2.8V)

| Parameter | MIN. | Typical | Max. | Unit |
|---|---|---|---|---|
| Operating current (Normal mode) | | 6.9 | | mA |
| Operating current (Green mode) | | 3.3 | | mA |
| Operating current (Sleep mode) | 70 | - | 120 | uA |
| Input voltage in low level(VDDIO=1.8V) | -0.3 | 0 | 0.45 | V |
| Input voltage in high level(VDDIO=1.8V) | 1.35 | 1.8 | 2.1 | V |

# 10. Package



| Symbol | Dimensions In Millimeters | | |
|---|---|---|---|
| | Min. | Normal | Max. |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | 0.035 | 0.05 |
| b | 0.40BSC | | |
| D | 6.00BSC | | |
| D1 | 4.40 | 4.50 | 4.60 |
| E | 6.00BSC | | |
| E1 | 4.40 | 4.50 | 4.60 |
| e | 0.15 | 0.20 | 0.25 |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.31 | 0.36 | 0.41 |
| L2 | 0.13 | 0.18 | 0.23 |
| K | 0.203BSC | | |

*** Controlling Dimension：MM**

# 11. Document History Record

| Version | Date | Description of change |
|---|---|---|
| Rev. 00 | 2012-12-27 | Draft version |
| Rev. 01 | 2013-01-08 | Modified register list<br>Add Filter function description in configuration information<br>Delete touch key and proximity sensing function description |
| Rev. 02 | 2013-03-19 | Modified reference circuit diagram into English version |
| Rev.03 | 2013-05-14 | Add reflow condition |
| Rev.04 | 2013-08-27 | Product features add support for ITO Film<br>Sensor development increases structural parameters SITO<br>Updated I2C communication parameters<br>Updated Power on diagram<br>Modified register list<br>Modified the description of sleep mode and wake-up timing diagram<br>Remove reflow condition<br>Updated the reference circuit<br>Modified the Absolute Operation Rating and normal mode operating current typ |