GT5663

With user-defined gesture chip capacitive touch wakeup

Rev.01 - 2015 year 10 month 13 day

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1. Outline

GT5663 It is designed for 4 "to 5" Design a new generation 10 Capacitive touch solutions, has 18 Driving channels and 10 Through induction Channel, in order to meet performance requirements of touch, GT5663 Also provides gloves, full-screen multi-gesture wake pen custom built HotKnot Technology and other differentiated features, giving users a richer consumer experience.

2. Features

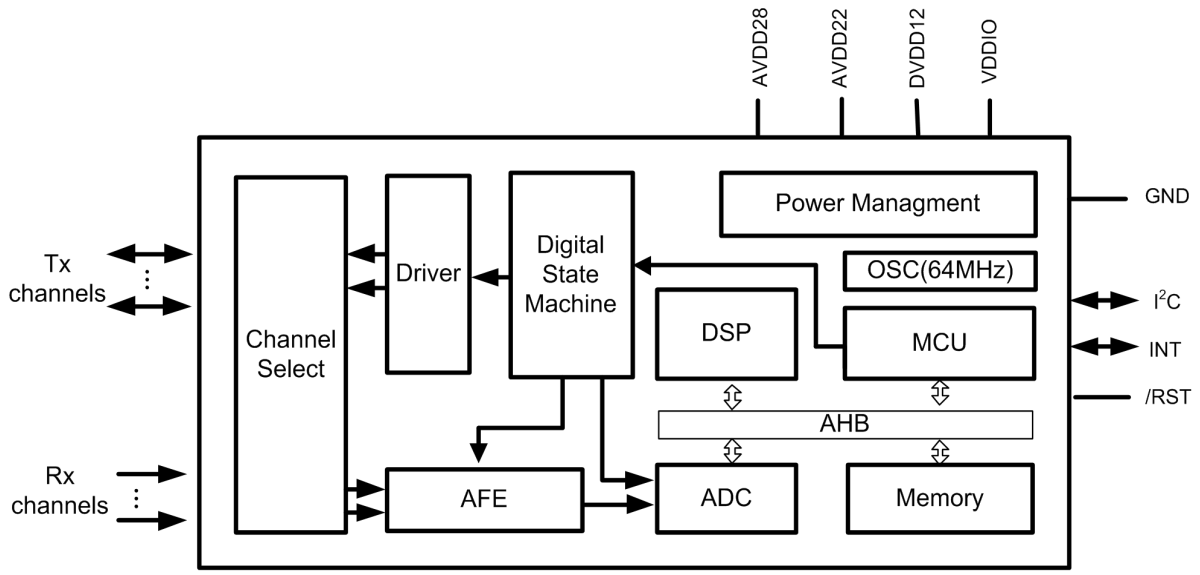
- Built capacitance detection circuit and high-performance MPU
    - Touch scanning frequency: 100Hz
    - Touch point coordinate real-time output
    - Unified version of the software for a variety of sizes capacitive screen
    - Single power supply, a built- 1.8V LDO
    - Flash Process technology, support online programming
    - Proximity sensing
    - HotKnot Features
- Capacitive screen sensor
    - Detection channels: 18 (Drive channel) * 10 (Sensing channels)
    - Capacitive screen size range: 4 "to 5"
    - stand by FPC Button design
    - Supports ITO Glass and ITO Film
    - Cover Lens The thickness of support: 0.55mm Glass ≦ ≦ 2mm ,

      0.5mm Acrylic ≦ ≦ 1.2mm Specific reference sensor Design Specification
    - Built-in frequency hopping function, support OGS Full fit
- HotKnot
    - transfer speed: 7.0Kbps (max)
    - Maximum data frame capacity: 128 byte

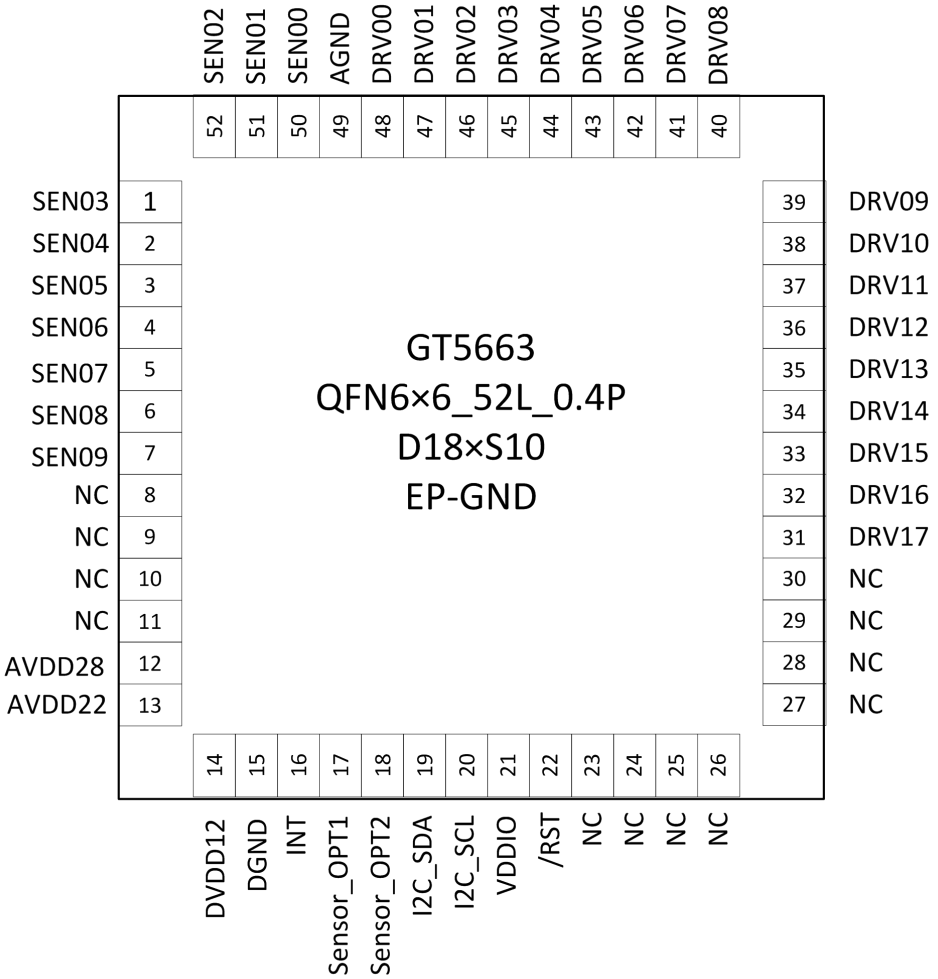
- Wake-up gesture
  - Fixed: Double-click, o , w , m , e , c , v ,>, s , ↑, ↓, ←, →, ^, <, z Single-double-click
  - 10 Multi-pen custom gestures
  - Recognition rate ≥ 95%
- High sensitivity function
  - Up to 1.35mm Three stuffed sheep glove
- Environmental adaptability
  - Initialization automatic calibration
  - Automatic drift compensation
  - Operating temperature:- 20 ℃ ~ + 85 ℃, humidity: ≦ 95% RH
  - Storage temperature:- 60 ℃ ~ + 125 ℃, humidity: ≦ 95% RH
- Communication Interface
  - standard I_2C Communication Interface
  - Slave mode of operation
  - stand by 1.8V ~ 3.3V Interface level
- Response time
  - Green mode: <48ms
  - Sleep mode: <200ms
  - Initialization: <200ms
- voltage:
  - Single-Supply: 2.8V ~ 3.3V

- Power Supply Ripple:
    - Vpp ≦ 50mV
- Package: 52 pins , 6mm * 6mm * 0.55mm, QFN, 0.4mm Pitch
- Application Development Support Tools
    - Touch screen module parameter detection and configuration parameters are automatically generated
    - Touch screen module integrated performance testing tools
    - Module production test tool
    - Master Software Development Reference code and documentation to guide drivers

3. Chip Schematic



4. Pin definitions



Pin number.	name	Functional Description	Remark
1-7	SEN03 ~ SEN09 The touch input analog signal		HotKnot When using function and also do Drive signal output
8 to 11	NC		
12	AVDD28	Analog positive power supply	Meet 2.2uF Filter capacitor
13	AVDD22		Meet 2.2uF Filter capacitor
14	DVDD12		Meet 2.2uF Filter capacitor
15	DGND	Digital signals	
16	INT	Interrupt signal	
17	Sensor_OPT1	Port identification module	
18	Sensor_OPT2	Port identification module	Need external pull-down
19	I2C_SDA	I2C Data signal	
20	I2C_SCL	I2C Clock signal	
twenty one	VDDIO	GPIO Level control	Meet 2.2uF Filter capacitor Suspended: 1.8V Meet AVDD : AVDD
twenty two	/ RST	System reset pin	Need external 10K Pull-up, pull reset
23 to 30	NC		
31 ~ 48	DRV17 ~ DRV00	Drive signal output	
49	AGND	Analog Ground	
50 ~ 52	SEN00 ~ SEN02 The touch input analog signal		HotKnot When using function and also do Drive signal output

5. Sensor design

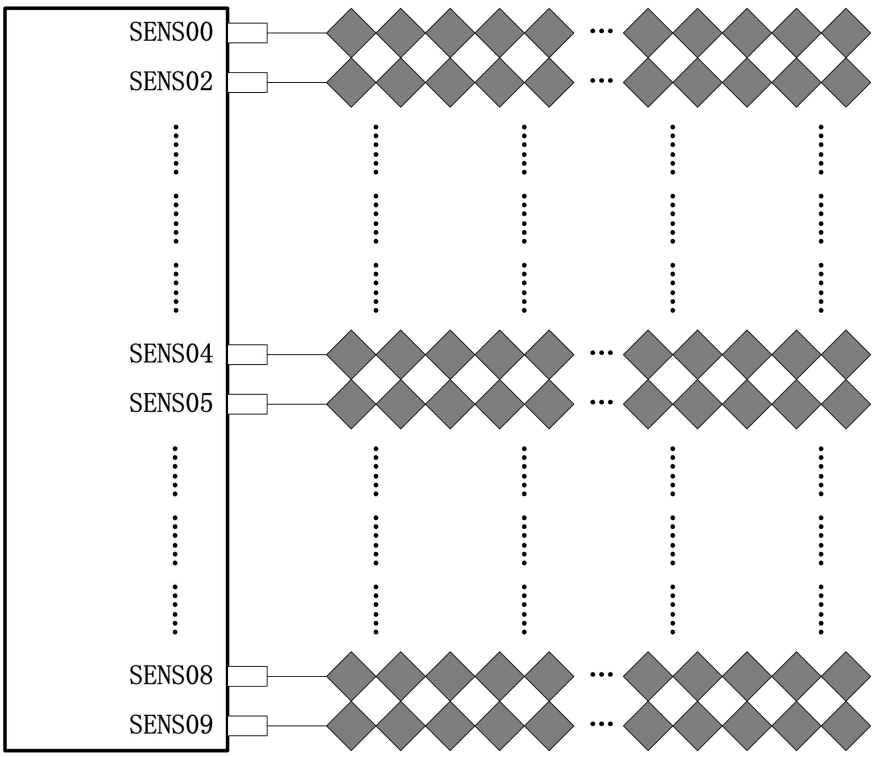
5.1. Sensing channels arranged

SENS00 ~ SENS09 Yes 10 Capacitance detecting input channels, directly with the touch screen module 10 Induction ITO Connected channels.

Module on induction ITO Channel connected to the chip sequence or reverse the order SENS00 to SENS09 . If the ITO Less channel

Detection channel in a chip, follow the "Channel Selector" to select a channel.

- Arrangement by way of example: Induction ITO Channel access order chip SENS00 to SENS09 .



5.2. Drive channel arrangement

DRV00 ~ DRV17 Yes 18 A capacitance detection drive signal output channel directly with the touch screen module 18 More ITO Drive through

Road connected. Driving lines follow the "Channel Selector" to select a channel and the channels are arranged, in determining the arrangement mode, configure

GT5663 Chip registers related to each of the drive to ensure consistent logical channels and the physical positional relationship between the positional relationship, so that

The physical coordinates match the coordinates.

Sensor Finer design rules, please refer to the specific layout guide.

5.3. Sensor design parameters

	GT5663
Drive channel trace impedance	≦ 10KΩ
Impedance drive channel	≦ 50KΩ
Trace impedance sensing channels	≦ 10KΩ
Impedance sensing channels	≦ 40KΩ
Node capacitance	≦ 4pF

In order to ensure data consistency and uniformity of the entire screen, the need to control trace impedance in line with the requirements of the table. Please refer to speci

of" Sensor Design specifications. "

Further, the driving and sensing trace trace adjacent parallel, to be inserted into the ground between them, and also refer to the width of the ground " Sensor

Design specifications. "

5.4. Touch button design

GT5663 stand by 4 Touch keys, there are two ways:

Sensor Expansion mode: a public key for the drive channel side, the drive channel and a 4 Root formation induced 4 Keys. Make

Drive channel button and the screen can not be multiplexed on the driving member, but as a key sensing channels must be multiplexed on the screen body;

FPC Design approach: a drive channel and separate out 4 Of sensing channels formed 4 Keys, 4 Screen of sensing passage

Part reuse. FPC of sensor Pattern to be designed.

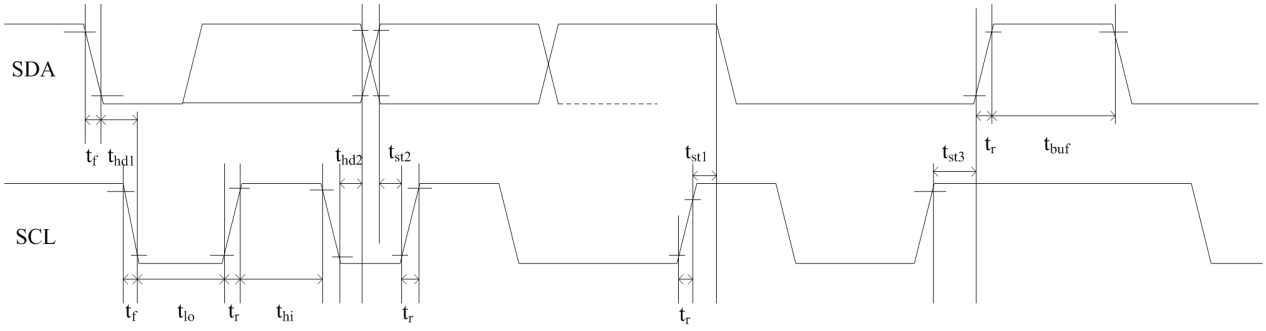
6. I2C communication

6.1. I2C communication

GT5663 Provide standard I2C Communication interface, by the SCL with SDA The main CPU Communication. in the system GT5663

Always as a slave device, all communications are the main CPU Launched, communication speed is recommended 400Kbps Or less. Its support

I2C Support hardware sequence is as follows:



Test Conditions 1 : 1.8V Communication Interface, 400Kbps Communication speed, pull-up resistor 2K

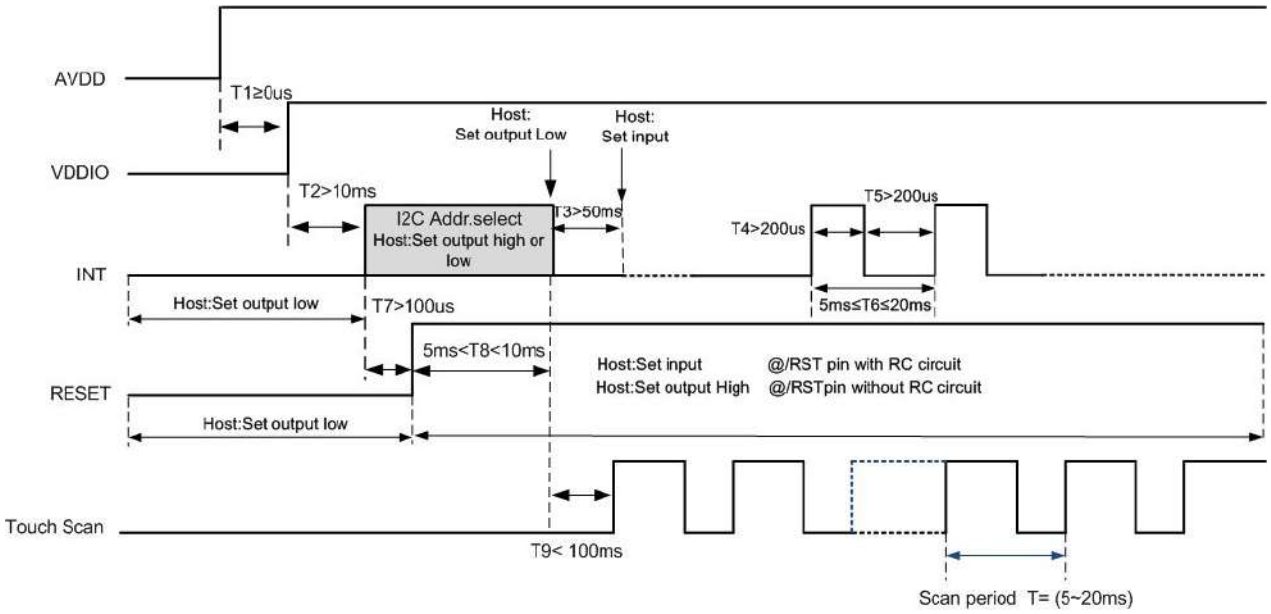
Parameter	Symbol	Min.	Max.		Unit
SCL low period	t_{lo}	1.3		-	us
SCL high period	t_{hi}	0.6		-	us
SCL setup time for START condition	t_{st1}	0.6		-	us
SCL setup time for STOP condition	t_{st3}	0.6		-	us
SCL hold time for START condition	t_{hd1}	0.6		-	us
SDA setup time	t_{st2}	0.1		-	us
SDA hold time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

Test Conditions 2 : 3.3V Communication Interface, 400Kbps Communication speed, pull-up resistor 2K

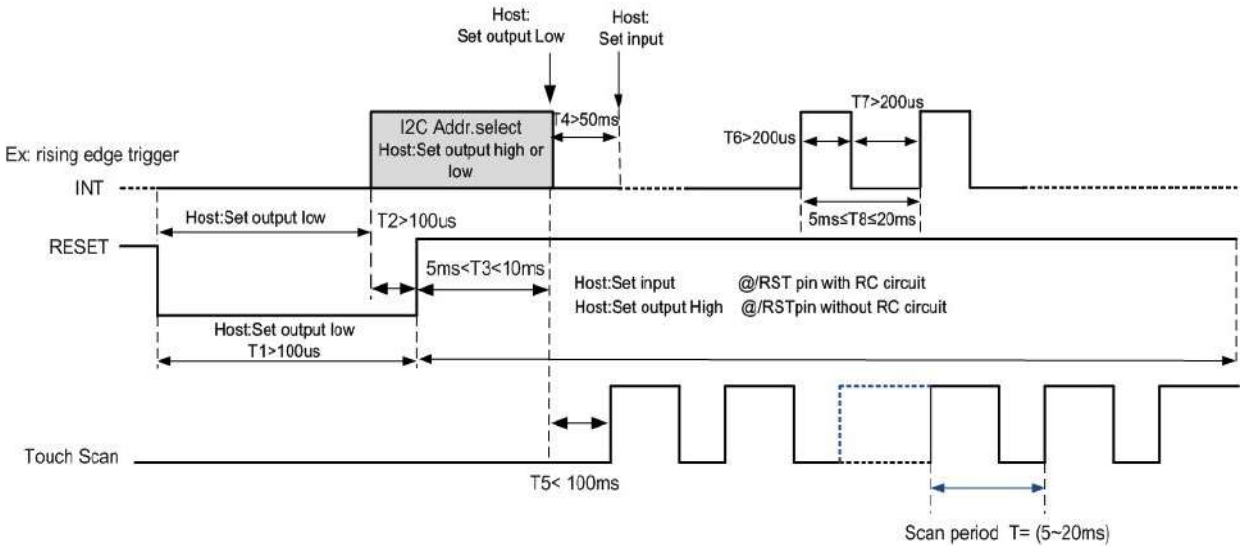
Parameter	Symbol	Min.	Max.		Unit
SCL low period	t_{lo}		1.3	-	us
SCL high period	t_{hi}		0.6	-	us
SCL setup time for START condition	t_{st1}		0.6	-	us
SCL setup time for STOP condition	t_{st3}		0.6	-	us
SCL hold time for START condition	t_{hd1}		0.6	-	us
SDA setup time	t_{st2}		0.1	-	us
SDA hold time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

GT5663 of I_2C There are two sets of slave address, respectively 0xBA / 0xBB with 0x28 / 0x29 . When the master at power initialization control Reset with INT Port state setting, and timing setting method is as follows:

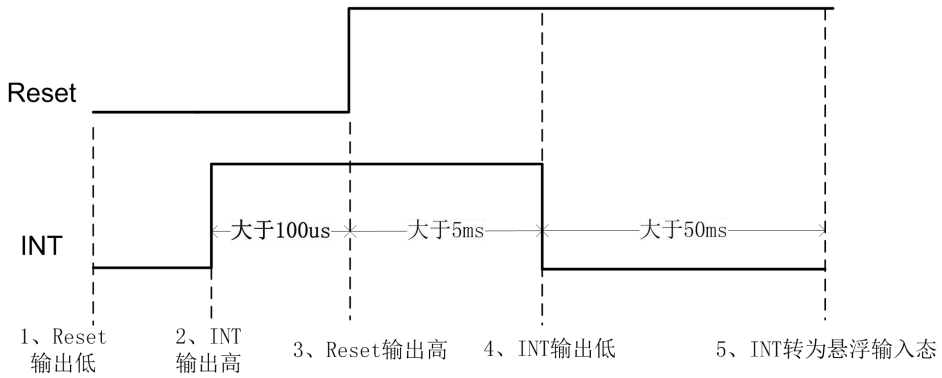
Power-timing diagram:



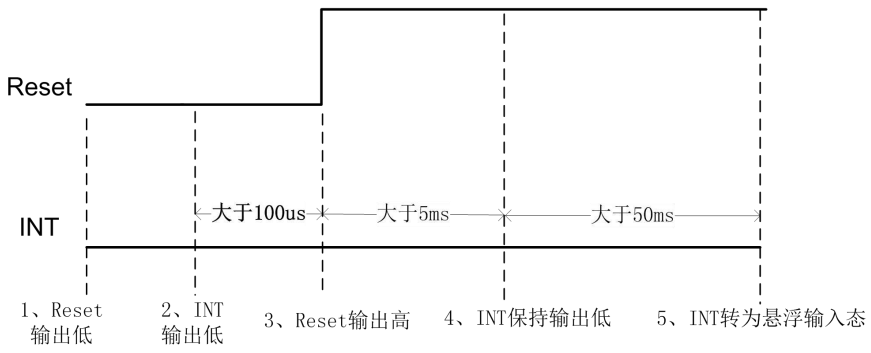
Master Reset GT5663 Timing Diagram:



Set address 0x28 / 0x29 Timing:



Set address 0xBA / 0xBB Timing:



a) data transmission

(To address equipment 0xBA / 0xBB For example)

Communication is always the main CPU Initiated valid start signal: in SCL Remains "1" Time, SDA The occurrence of "1" To "0"

The jump. Address information or data streams are transmitted after the start signal.

All connections I^2C From devices on the bus, to be transmitted on the bus after detecting the start signal 8 Bit address information, and do

The correct response. Upon receipt of the address information and their own matches GT5663 In the first 9 Clock cycle, SDA Changed

Output ports, juxtaposed "0" As a response signal. If you receive address information does not match with their own, that is, non 0XBA or 0XBB ,

GT5663 It will remain idle.

SDA Data port on the press 9 Serial transmit clock cycles 9 Bit data: 8 Valid data plus 1 Receiver sends the acknowledge bit

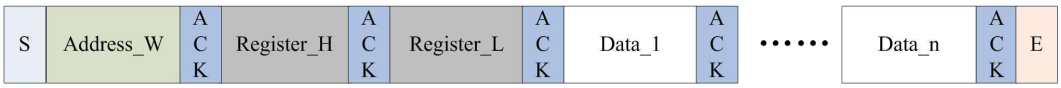
signal ACK Or non-acknowledgment signal NACK . Data transmission SCL for "1" Valid.

When the communication is completed, the main CPU Stop signal is sent. When the stop signal is SCL for "1" Time, SDA By the state "0" To "1"

The jump.

b) Correct GT5663 Write

(To address equipment 0xBA / 0xBB For example)



WRITE OPERATION TIMING

Based on the map CPU Correct GT5663 A flowchart of a write operation performed. First, the main CPU Generating a start signal, and then transmits

Address information and write bits of information "0" It indicates a write operation: 0XBA .

After receiving the response, the main CPU Transmission register 16 Bit address, followed by 8 The data bits to be written to the register contents.

GT5663 The address pointer register are automatically added to the write operation 1 So when the main CPU It requires continuous address register

When a write operation, a write operation can be continuously written. Write operation is completed, the main CPU Sending a stop signal to end the current

Write operation.

c) Correct GT5663 Read

(To address equipment 0xBA / 0xBB For example)

Read Timing FIG.

Based on the map CPU Correct GT5663 A flowchart of a read operation performed. First, the main CPU Generating a start signal, and then transmits

Device address information and write bits of information "0" It indicates a write operation: 0XBA .

After receiving the response, the main CPU Send first register 16 Bit address information, the address setting register to be read. Receipt

After answering, the main CPU Retransmits the start signal, transmits a read operation: 0XBB . After receiving the response, the main CPU Started reading

Take data.

GT5663 Also supports consecutive read operations, the default is to read data. the Lord CPU In each receive a Byte After the data needed

Transmitting a response signal indicating successful reception. In the last received desired Byte After the data, the main CPU send " Non-should

A signal NACK " And then sends a stop signal the end of communication.

7.HotKnot mode

7.1. start up HotKnot

When data is sent, the main CPU Issued proximity detection mode command to enter the host 0x21 , Then the terminal can be detected with

The receiving end of the communication. Successfully detected another support HotKnot Technical communications terminal, will be INT The main way to inform CPU

shut down LCD After data communication.

7.2.TP Data transmission between

After successful detection of proximity, the master issued HotKnot Transmission firmware, the firmware transmission operation, the incoming data transfer mode, silent

Recognized in the receiving state, i.e., detecting whether data sent from the transmitting side. when GT5663 The transmit buffer is refreshed correctly,

Will immediately start transmission, the receiving side can detect the data.

7.3.CPU From GT5663 Receive data

GT5663 Or sending the data after receiving a, by flipping will INT To notify CPU deal with. when GT5663 Receiving a complete

Frame data, CPU First get HotKnot A status register, when receiving the status register indicates a successful reception of the data,

CPU Go to the receive buffer data received by I^2C Read up, go down to the specified address after reading the write up 0xAA ,

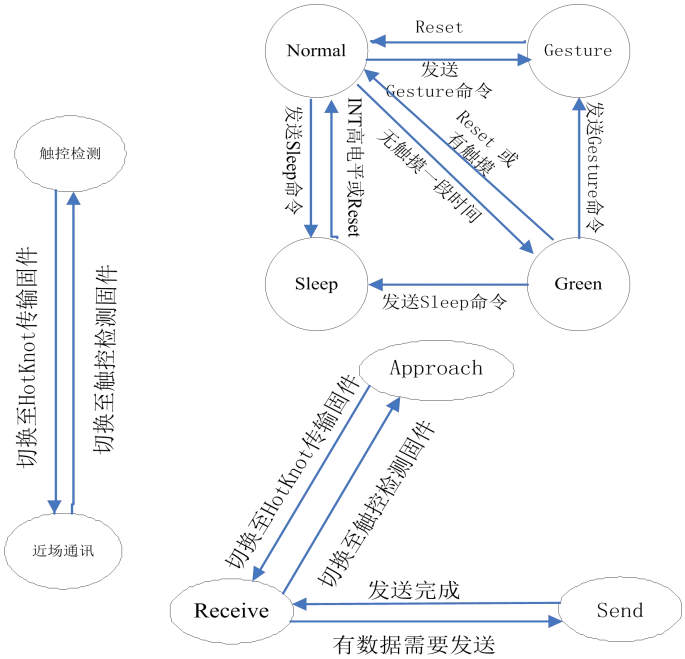
inform GT5663 Data reading is completed. The same is true for sending, after obtaining the state successfully sent, write to the address specified

0xAA ,inform GT5663 It has been processed, GT5663 It will automatically switch to the received data until the buffer is transmitted

Refresh again will start the transmission.

8. Functional Description

8.1 Operating mode



a) Normal Mode

GT5663 in Normal mode , The coordinates of the fastest refresh cycle 5ms-20ms Room (dependent on the setting of the configuration information, Configuration information controlled period in steps of 1ms).

Normal mode State, the time period of no touch event occurs, GT5663 Will be automatically transferred Green mode To reduce Power consumption. GT5663 No Touch Auto to enter Green mode The time can be set by the configuration information, the range of 0 ~ 15s ,step Enter into 1s .

b) Green Mode

in Green mode under, GT5663 Scanning cycle is about 40ms (Default), upon detecting a touch action occurs, since the Move into the Normal mode .

c) Gesture mode

the Lord CPU Issued by I2C Command, let GT5663 enter Gesture mode After sliding through the screen body, or double-click

Writing specific characters on screen body achieved wake.

in Gesture mode under, GT5663 Detecting the finger sliding sufficient length in the screen body, double click action, writing a specific

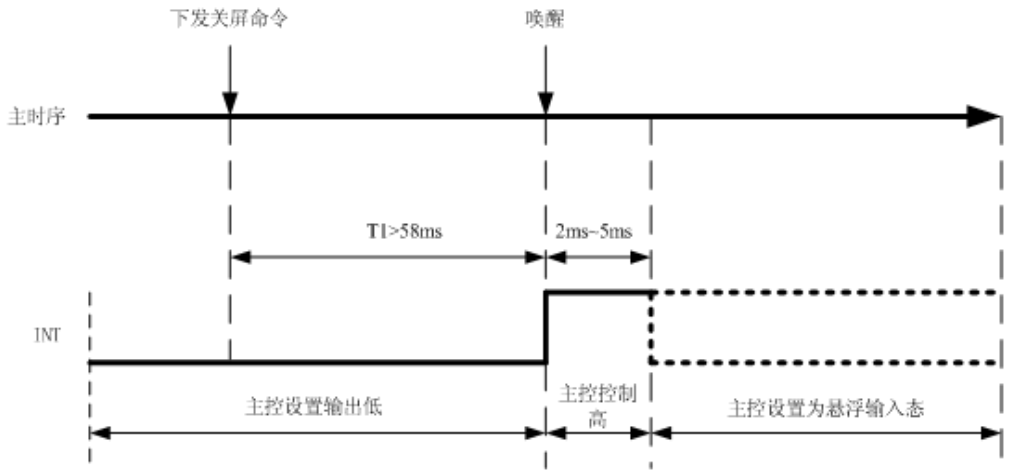
Characters, writing custom character, INT Will output a 250us About the pulse, the pulse is received master woke up bright screen.

d) Sleep Mode

the Lord CPU by I2C Command, the GT5663 enter Sleep mode (Need to first INT Pin output low). When you need

GT5663 drop out Sleep mode , The host outputs a high level to INT Foot (playing host high INT foot 2 ~ 5ms), Call

Wake up GT5663 Will enter Normal mode . Issued I2C The time between wake-up commands is larger than the spacing requirement off-screen 58ms .



e) Approach Mode

When enabled HotKnot After the proximity detection function, GT5663 The default run Approach Mode Next, when exit this mode,

the Lord CPU Issued by 0x20 or 0x21 Command, the GT5663 enter Approach mode . In this mode, the touch detection

And measuring a near field proximity detection phase is performed. Approach mode There is a difference in the transmission mode and the receiver: the sender is a

Sends a beacon law convention agreed upon by the drive frequency of the induction passage, and then sending the receiving end detects whether the return is received c

Law convention beacon frequency, thereby determining the presence or absence of a receiving end. At the receiving end, Approach mode Whether it has been detected

Agreed rule sending end receives the sent beacon frequency convention, if the detected beacon law convention agreed to return the frequency of notifications sent

The sending end. in Approach mode Next, when the communication terminal can be found near field, will INT The main way of notification CPU

To get the status. In order to ensure reliable detection of both the transceiver to the other side, when the get to close to the state, must remain at least

150ms Detection, the main CPU And then issued HotKnot Transfer into the firmware Receive mode .

f) Receive Mode

in GT5663 operating Approach mode , The main CPU Get to GT5663 Detecting that the communication terminal, the main CPU

And then issued HotKnot The firmware transmission GT5663 enter Receive mode . In this mode, continuously detecting the presence of the starting

Frame signal is detected after start detection data reception is complete, be verified, if the verification fails, to reinitiate; if

Successfully received, places INT Notify the master CPU Receiving read data buffer.

g) Send Mode

in GT5663 operating Receive mode , The main CPU The outgoing data to the transmission buffer, GT5663 Detect

When the transmit buffer is flushed and the need to send data automatically from Receive mode Switch to Send mode . In the

Mode, to transmit a frame start signal, and has returned to the receiver detects ACK , Followed by transmission data signal, transmitted END

Data sequences, detecting the start ACK ; If ACK There is no right or wrong, just sent a retransmission of bytes retransmitted if more than five are lost

Lost, the present frame will begin sending data again, until the main CPU Timeout quits. After data transmission is completed successfully, the main to be CPU

After processing or time-out, automatically switches to Receive mode .

8.2 Interrupt Sense

When there is a touch, GT5663 Each scan will cycle through INT Foot pulsing signal to inform the master CPU Read coordinates Letter

interest. the Lord CPU Through the associated register bit "INT" To set the trigger. Set "0" Represents rising edge triggered, that there

When the user operation, GT5663 Will be at INT Rising output port hopping, notice CPU ; Set "1" As a falling edge trigger, that is

When there is a user operation, GT5663 Will be at INT Falling output port transitions.

8.3 Sleep Mode

When the display is off, or in other states need not operate a touch screen, by I_2C The command GT5663 enter

Sleep mode To reduce power consumption. When you need GT5663 During normal operation, the master INT High-level period of the output port

To wake it up. Master Control GT5663 Goes to sleep and exit sleep timing, please refer to the specific timing of the first 8.1 Section.

8.4 Frequency hopping

GT5663 Have a good anti-jamming hardware basis, when GT5663 Driving spectrum peak spectrum interference signal is superimposed,

It may be switched to another frequency by adaptive frequency hopping mechanism, thus avoiding interference.

8.5 Automatic calibration

a) Initialize Calibration

Different temperature, humidity and physical space structure of the sensor will affect the capacitance of the reference value in the idle state. GT5663 Will be at

Initialization 200ms Automatically detecting the new reference depending on circumstances. Finished initializing touch screen detection.

b) Automatic drift compensation

Slowly changing environmental factors like temperature, humidity, or dust, will also affect the value of the reference capacitance sensor idle state.

GT5663 Real-time detection of changes of points of data, statistical analysis of historical data, thereby correcting a detection reference. Thus drop

Impact on the touch screen detection of low environmental changes.

8.6 Gesture Drive mode modified

- **After entering the off-screen Gesture mode**

1) When the power button (or other buttons) off-screen, to 0x8040 Issued the command 8 ;

2) Modifications consistent with the modified when the power button (or other buttons) screen off the phone automatically when the off-screen;

3) During the off screen, slide, double-click the screen or write a specific character INT Will output a 250us About pulses main

After receiving the control pulse read 0x814B Values, such as the reset condition is satisfied wakeup 5663 And wake up bright screen, otherwise cleared

0x814B Waiting for next pulse.

- **After entering the off-screen Sleep mode**

1) When the power button (or other buttons) off-screen, to 0x8040 Issued the command 5 ;

2) Modifications consistent with the modified when the power button (or other buttons) screen off the phone automatically when the off-screen;

3) In this mode only by a power supply key (or home Key) wake up.

- **Press the power button (or home Key) to open screen**

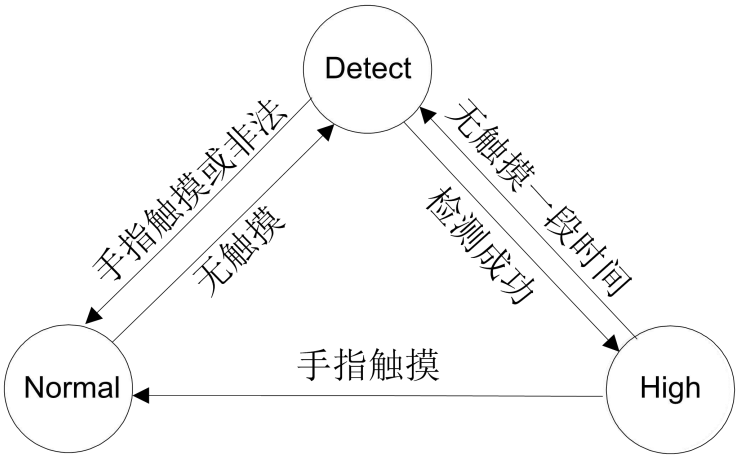
In any mode, press the on-screen button (or home Key) opening screen, in accordance with the reset timing reset directly IC , Perform a reset process.

- **Recommendations with IR Coordinate**

If you can use IR To cope, when the screen is off IR Detects an object block, may enter the original sleep Mode, so that less power;

Detecting a gesture unobstructed proceeds awake mode into a different mode of the method of the above (for an issued command and then reset).

8.7 Sensitivity state switching



a) Normal State (normal sensitivity)

in Normal Under the state, the use of higher touch threshold to locate a signal identification touch the touch position, to reduce the noise interference,

In this state only supports finger touch.

b) High State (high sensitivity)

in High State. A lower touch threshold to locate a signal identification touch the touch position, and this state is supported gloves

Touch pen to paper. In this state, upon detecting a finger touch, to return to the Normal status.

c) Detect status

Normal State or touchless High Touchless state period of time, GT5663 Will be automatically transferred Detect status. in

Detect State detecting when a finger touch or touch a plurality of weak signals, it switches to Normal State; in Detect When the state

Detecting a single weak signal occurs twice in succession or the slide operation, the process proceeds to High status. in Detect The state does not

Coordinate reporting.

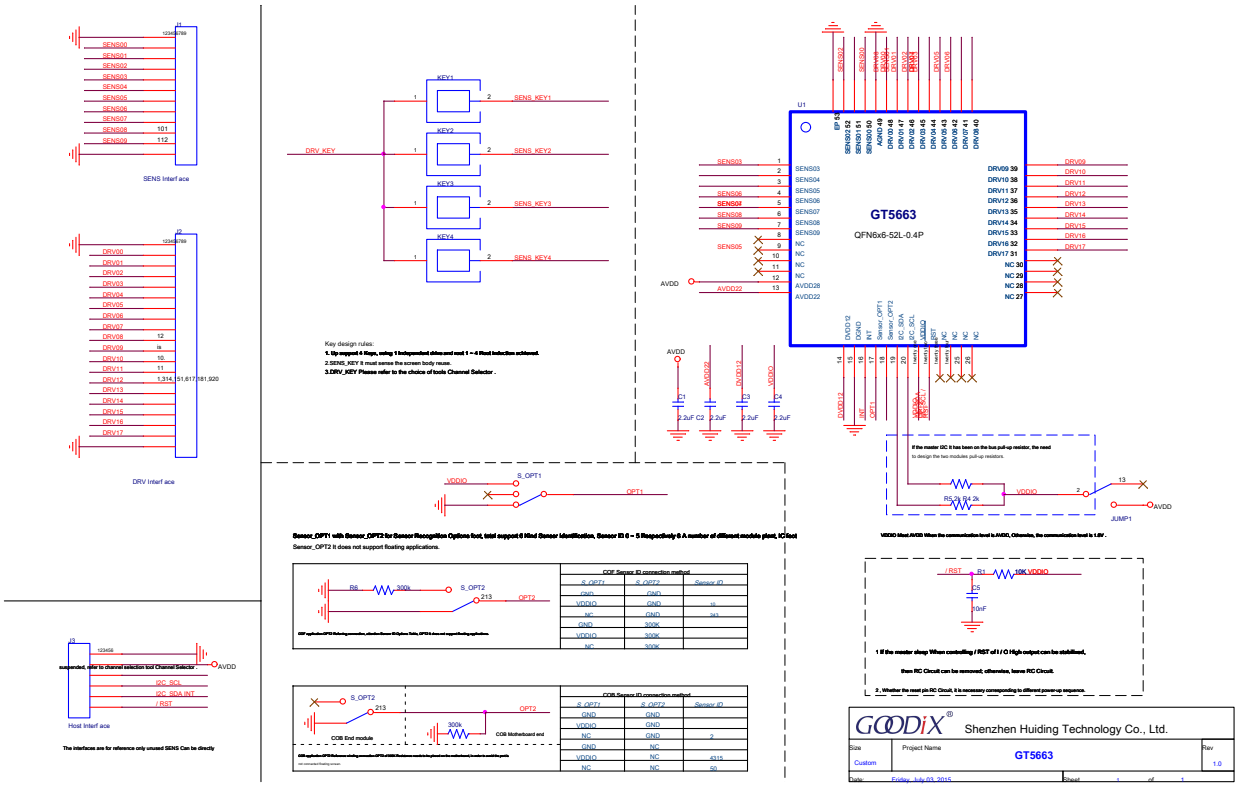
d) Gloves material

Because different materials in different thickness, the market a wide range of gloves. Because of differences, where the material for gloves and

The thickness of an adaptive be described, from the material point of view the glove metal surface, the better the leather, wool, nylon, cotton was next.

From the point of view the thickness of the metal, the thickness of the leather material supported larger, wool, nylon, cotton supported thinner.

9. Reference Schematic



GT5663 Reference Application Circuit

Note:

1) This circuit represents only the basic application mode, actual or part of the circuit needs to be adjusted according to the application environment.

2) Capacitance recommended X7R Material.

10. Electrical Characteristics

10.1 Limit electrical parameters

parameter	Minimum	Maximum	unit
Analog supply AVDD28 (reference AGND)	-0.3	4.2	V
VDDIO (reference DGND)	-0.3	4.2	V
digital I / O Withstand voltage	-0.3	4.2	V
simulation I / O Withstand voltage	-0.3	4.2	V
range of working temperature	--20	85	℃
Storage Temperature Range	- 60	125	℃
ESD Voltage protection (HB Model)	± 4		kV

10.2 Recommended operating conditions

parameter	Minimum	Typical values	Maximum	unit
AVDD28	2.8	-	3.3	V
VDDIO	1.8	-	AVDD28	V
Operating temperature	--20	25	85	℃

10.3 AC characteristic

(Ambient temperature 25 ℃, AVDD28 = 2.8V , VDDIO = 1.8V)

parameter	Minimum	Typical values	Max Unit	
OSC The oscillation frequency	63.36	64.0	64.64	MHz
I / O From low to high output transition time	-	12.5@20pf	-	ns
I / O Output from high to low transition time	-	8.5@20pf	-	ns

10.4 DC characteristic

(Ambient temperature 25 ℃, AVDD28 = 2.8V , VDDIO = 1.8V or VDDIO = AVDD28)

parameter	Minimum	Typical values	Max Unit	
Normal mode Working current	-	17	-	mA
Green mode Working current	-	5	-	mA
Sleep mode Working current	39	-	135	uA
Digital input low voltage / VIL	-0.3		0.25 * VDDIO	V
Digital input voltage is high / VIH 0.75 * VDDIO			VDDIO + 0.3	V
The digital output is low voltage / VOL			0.15 * VDDIO	V
The digital output is high voltage / VOH 0.85 * VDDIO				V

11. SMT Reflow Requirements

11.1 Moisture sensitivity level

GT5663 moisture level 3 (MSL3), which requirements are:

1) an effective retention time in a vacuum pack: Under normal storage conditions the electronic components 12 months; storage conditions:

Temperature <40 ℃, relative humidity <90% RH

2) After the vacuum package is opened, if the device is an infrared device or equivalent conditions at reflux for processing (temperature does not exceed 260 ℃),

You must meet the following conditions:

a) production within 168 hours on line (plant environment ≤30 ℃ / 60% RH)

b) stored at ≤10% RH conditions (e.g. stored in a drying cabinet)

3) under the following conditions, a drying process is required before the device production line:

a) at 23 ± 5 ℃, humidity indicator display> 20%

b) does not meet 2a or 2b

4) If the device requires the drying process, the drying time

The a) low-temperature package sealing device (e.g. tape packaged products), dried at 40 ℃ + 5 ℃ / -0 ℃ <5% RH Condition

192 hours

b) if the sealed package is a high-temperature devices (e.g., tray packaging products), dried for 24 hours at 125 ℃ + 5 / -0 ℃

Time

c) After completion of baking, vacuum cooled for immediate loading. Vacuum packaging tape placed not less than 5 grams and a drying agent

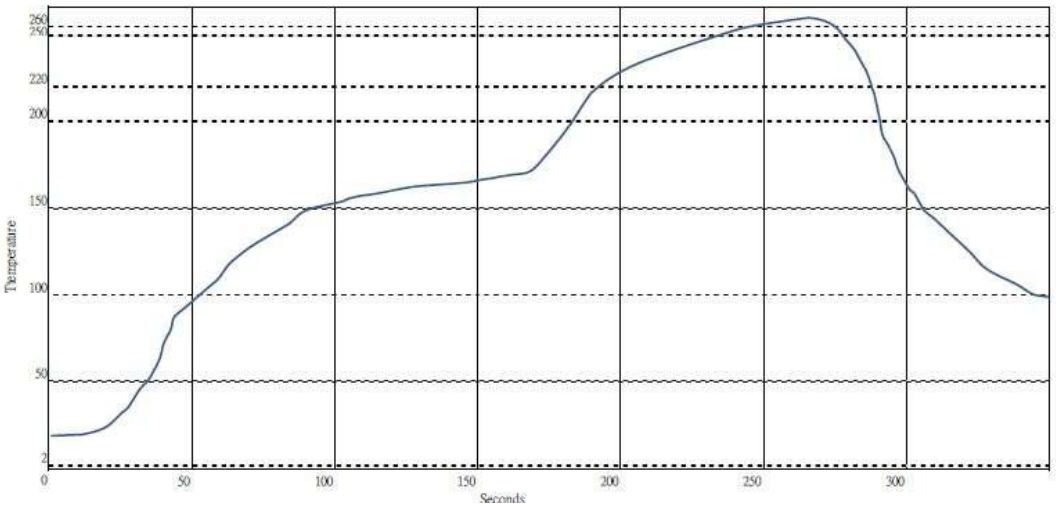
Zhang 6:00 humidity indicator card evacuated and sealed; vacuum packaging tray placed not less than 10 g and a desiccant

Zhang 6:00 humidity indicator card sealed and evacuated.

11.2 Reflow times

Reflow number ≤3 times.

11.3 Schematic view for explaining lead-free reflow profile

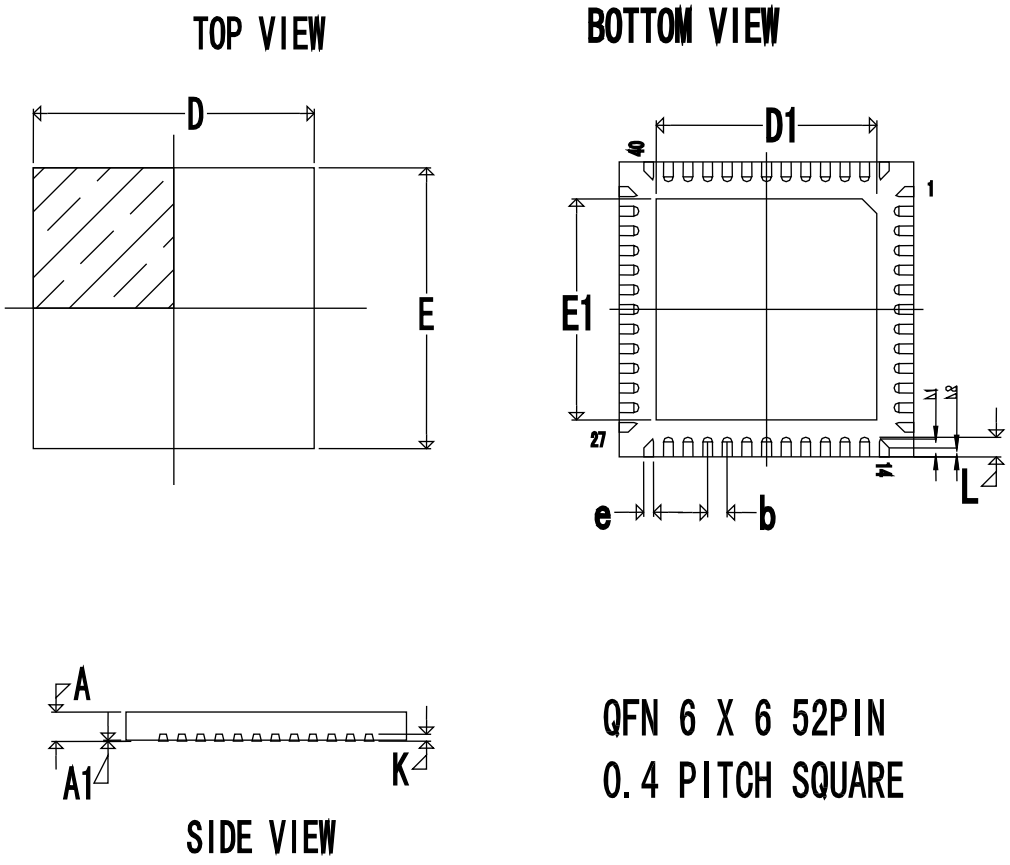


In accordance with J-STD-020D-01, a top sink QFN chips Lead (Pb-Free) described in the table below reflux temperature profile grid.

<table>
<tr><th colspan="4">Interval</th><th colspan="3">Lead time process parameters (reference)</th></tr>
<tr><td rowspan="7">Room temperature
To peak
Temperature values
Of order
segment</td><td colspan="2" rowspan="2">A preheating zone
(25 ℃ ~ 150 ℃)</td><td>Duration</td><td colspan="2">80S ~ 120S</td><td rowspan="7">Room temperature to peak
Temperature stage
No more than
8 minutes</td></tr>
<tr><td>RISE</td><td colspan="2"><3 ℃ / s</td></tr>
<tr><td colspan="2" rowspan="2">B temperature zone
(150 ℃ ~ 200 ℃)</td><td rowspan="2">Duration</td><td colspan="2">60S ~ 120S
(Department of the top recommended 100S)</td></tr>
<tr><td colspan="2"><1 ℃ / s</td></tr>
<tr><td rowspan="3">217 ℃
More order
segment</td><td rowspan="2">C 217 ℃ ~ 260 ℃</td><td>Duration</td><td>60S ~ 85S</td><td rowspan="3">217 ℃ to maintain the above recommendations
Time Between 60S ~ 150S</td></tr>
<tr><td>RISE</td><td><3 ℃ / s</td></tr>
<tr><td>D polar zone 255 ℃ ~ 260 ℃ Duration</td><td></td><td>20S ~ 30S</td></tr>
<tr><td>- -</td><td colspan="2">E 260 ℃ ~ 217 ℃</td><td>Duration
Cooling slope</td><td>60S ~ 75S
<6 ℃ / s</td><td>- -</td></tr>
<tr><td>- -</td><td colspan="2">F217 The following cooling zone ℃</td><td>Cooling slope</td><td colspan="2">1 ℃ / s 3 ~ ℃ / s</td><td>- -</td></tr>
</table>

Note: Do accordance with J-STD-020D-01 standard.

12. Product Packaging



Symbol	Dimensions In Millimeters		
	Min.	Normal	Max.
A	0.50	0.55	0.60
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	

13. Version History

Modified versions of files		Revise
Rev.00	2015-05-15	Pre-release version
Rev.01	2015-10-13	Release

14. Contact information

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GT5663

带自定义手势唤醒功能的电容触控芯片

Rev.01——2015 年 10 月 13 日

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目录

1. 概述

GT5663 是专为 4”~5” 设计的新一代 10 点电容触控方案，拥有 18 个驱动通道和 10 个感应通道，以满足高性能的触控要求，GT5663 还提供手套操作、全屏多笔自定义手势唤醒、内置 HotKnot 技术等差异化功能，给用户以更丰富的消费体验。

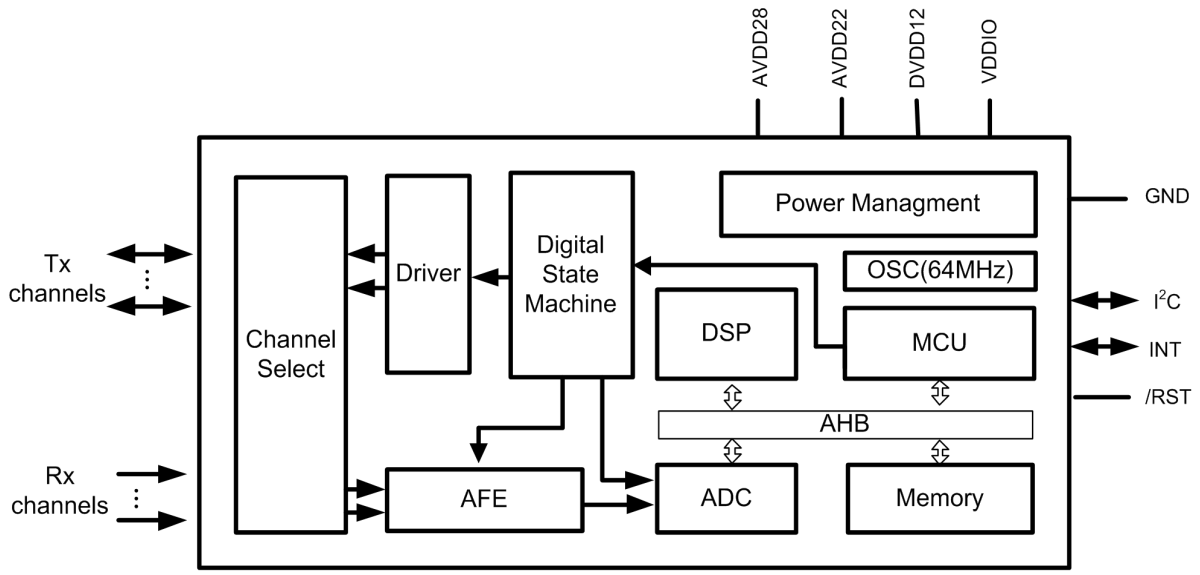
2. 产品特点

- ✧ 内置电容检测电路及高性能 MPU
  - ➢ 触摸扫描频率：100Hz
  - ➢ 触摸点坐标实时输出
  - ➢ 统一软件版本适用于多种尺寸的电容屏
  - ➢ 单电源供电，内置 1.8V LDO
  - ➢ Flash 工艺制程，支持在线烧录
  - ➢ 接近感应功能
  - ➢ HotKnot 功能
- ✧ 电容屏传感器
  - ➢ 检测通道：18 (驱动通道)*10 (感应通道)
  - ➢ 电容屏尺寸范围：4”~5"
  - ➢ 支持 FPC 按键设计
  - ➢ 同时支持 ITO 玻璃和 ITO Film
  - ➢ Cover Lens 厚度支持：0.55mm≦玻璃≦2mm，
    0.5mm≦亚克力≦1.2mm，具体参考 sensor 设计规范
  - ➢ 内置跳频功能，支持 OGS 全贴合
- ✧ HotKnot
  - ➢ 传输速度：7.0Kbps(max)
  - ➢ 数据帧最大容量：128 byte

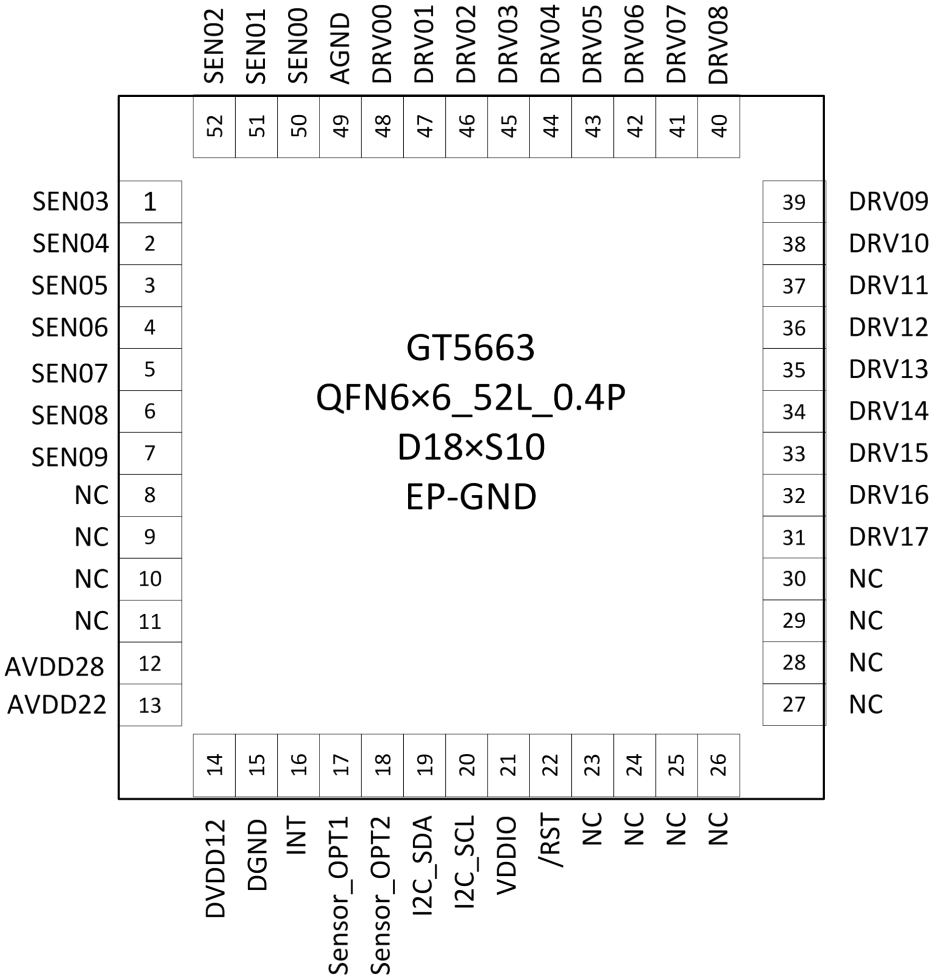
- ✧ 手势唤醒
  - ➢ 固定: 双击, o、w、m、e、c、v、>、s、↑、↓、←、→、^、<，z、单双击
  - ➢ 10 个多笔自定义手势
  - ➢ 识别率≥95%
- ✧ 高灵敏度功能
  - ➢ 最高支持 1.35mm 的羊毛绒三级手套
- ✧ 环境适应性能
  - ➢ 初始化自动校准
  - ➢ 自动温漂补偿
  - ➢ 工作温度：-20℃~+85℃，湿度：≦95%RH
  - ➢ 储存温度：-60℃~+125℃，湿度：≦95%RH
- ✧ 通讯接口
  - ➢ 标准 I^2C 通讯接口
  - ➢ 从设备工作模式
  - ➢ 支持 1.8V~3.3V 接口电平
- ✧ 响应时间
  - ➢ Green mode: <48ms
  - ➢ Sleep mode: <200ms
  - ➢ Initialization: <200ms
- ✧ 电源电压：
  - ➢ 单电源供电：2.8V~3.3V

- 电源纹波：
  - Vpp≦50mV
- 封装：52 pins，6mm*6mm*0.55mm, QFN, 0.4mm Pitch
- 应用开发支持工具
  - 触摸屏模组参数侦测及配置参数自动生成
  - 触摸屏模组性能综合测试工具
  - 模组量产测试工具
  - 主控软件开发参考驱动代码及文档指导

3. 芯片原理图



4. 管脚定义


SEN02 52
SEN01 51
SEN00 50
AGND 49
DRV00 48
DRV01 47
DRV02 46
DRV03 45
DRV04 44
DRV05 43
DRV06 42
DRV07 41
DRV08 40
SEN03 1
SEN04 2
SEN05 3
SEN06 4
SEN07 5
SEN08 6
SEN09 7
NC 8
NC 9
NC 10
NC 11
AVDD28 12
AVDD22 13
39 DRV09
38 DRV10
37 DRV11
36 DRV12
35 DRV13
34 DRV14
33 DRV15
32 DRV16
31 DRV17
30 NC
29 NC
28 NC
27 NC
GT5663
QFN6×6_52L_0.4P
D18×S10
EP-GND
14 DVDD12
15 DGND
16 INT
17 Sensor_OPT1
18 Sensor_OPT2
19 I2C_SDA
20 I2C_SCL
21 VDDIO
22 /RST
23 NC
24 NC
25 NC
26 NC

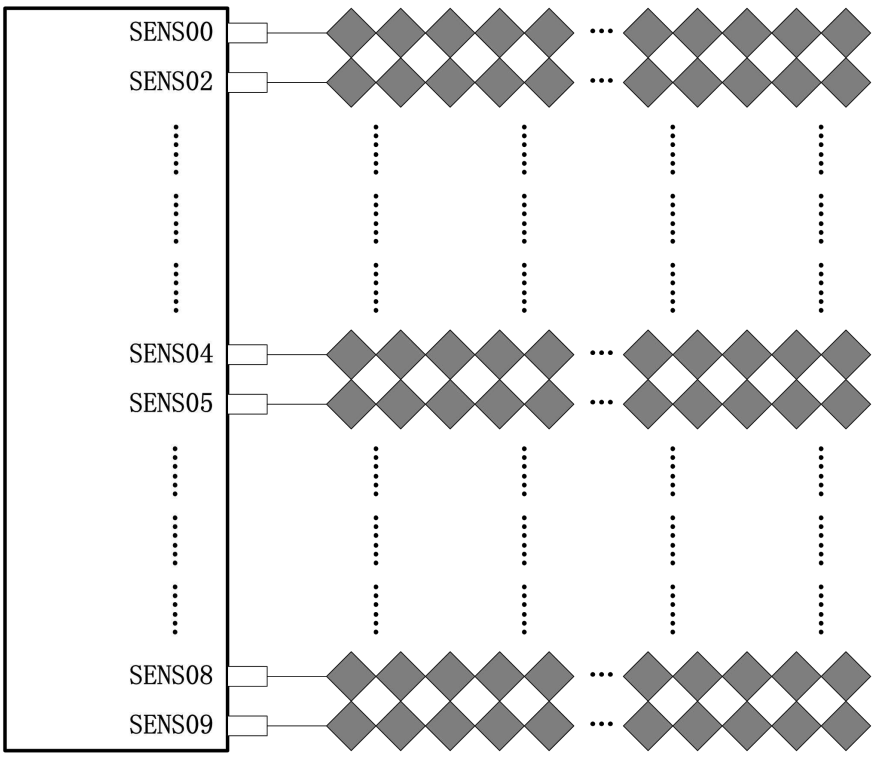
管脚号.	名称	功能描述	备注
1~7	SEN03~SEN09	触摸模拟信号输入	HotKnot 功能使用时同时也做驱动信号输出
8~11	NC		
12	AVDD28	模拟电源正	接 2.2uF 滤波电容
13	AVDD22		接 2.2uF 滤波电容
14	DVDD12		接 2.2uF 滤波电容
15	DGND	数字信号地	
16	INT	中断信号	
17	Sensor_OPT1	模组识别口	
18	Sensor_OPT2	模组识别口	需外部下拉
19	I2C_SDA	I^2C 数据信号	
20	I2C_SCL	I^2C 时钟信号	
21	VDDIO	GPIO 电平控制	接 2.2uF 滤波电容 悬空：1.8V 接 AVDD：AVDD
22	/RST	系统复位脚	需外部 10K 上拉，拉低复位
23~30	NC		
31~48	DRV17~DRV00	驱动信号输出	
49	AGND	模拟电源地	
50~52	SEN00~SEN02	触摸模拟信号输入	HotKnot 功能使用时同时也做驱动信号输出

5. 传感器设计

5.1. 感应通道排布

SENS00~SENS09 是 10 个电容检测输入通道，直接与触摸屏模组的 10 个感应 ITO 通道相连。模组上感应 ITO 通道按照顺序或逆序依次连接至芯片的 SENS00 至 SENS09。若 ITO 通道少于芯片检测通道，请按照《通道选择器》来选择通道。

- 排布方式示例：感应 ITO通道按照顺序接入芯片的SENS00至SENS09。



5.2. 驱动通道排布

DRV00~DRV17 是 18 个电容检测驱动信号输出通道，直接与触摸屏模组的 18 个 ITO 驱动通道相连。驱动线请按照《通道选择器》来选择通道和排布通道，在确定排布方式后，需配置 GT5663 芯片的相关寄存器来保证各驱动通道的逻辑位置关系与物理位置关系一致，以使输出坐标与物理坐标匹配。

Sensor 设计的更细规则，请参考具体 layout 指南。

5.3. 传感器设计参数要求

	GT5663
驱动通道走线阻抗	≦10KΩ
驱动通道阻抗	≦50KΩ
感应通道走线阻抗	≦10KΩ
感应通道阻抗	≦40KΩ
节点电容	≦4pF

为保证整屏数据一致性和均匀性，需要控制走线阻抗符合上表要求。具体的要求请参照 Goodix 的《Sensor 设计规范》。

另外，驱动走线与感应走线相邻且平行时，需在两者间插入地线，且地线宽度也请参考《Sensor 设计规范》。

5.4. 触摸按键设计

GT5663 支持 4 个触摸按键，实现方式有两种：

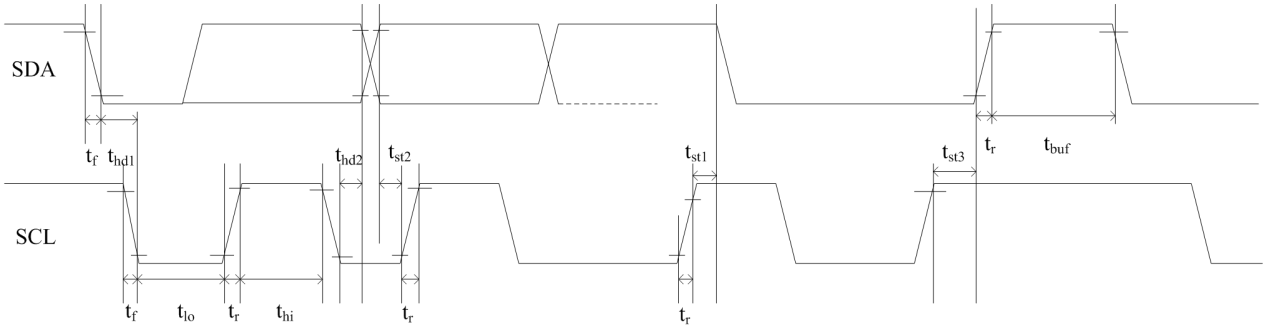
Sensor 扩展方式：由驱动通道作按键公共端，将一条驱动通道与 4 根感应形成 4 个按键。作按键的驱动通道不可与屏体上驱动复用，但作按键的感应通道必须与屏体上复用；

FPC 设计方式：单独拿出一条驱动通道与 4 条感应通道形成 4 个按键，4 条感应通道与屏体部分复用。FPC 的 sensor 图案需专门设计。

6. I²C 通讯

6.1. I²C 通讯

GT5663 提供标准的 I²C 通讯接口，由 SCL 和 SDA 与主 CPU 进行通讯。 在系统中 GT5663 始终作为从设备，所有通讯都是由主 CPU 发起，建议通讯速度为 400Kbps 或以下。其支持的 I²C 硬件电路支持时序如下：



测试条件 1：1.8V 通讯接口，400Kbps 通讯速度，上拉电阻 2K

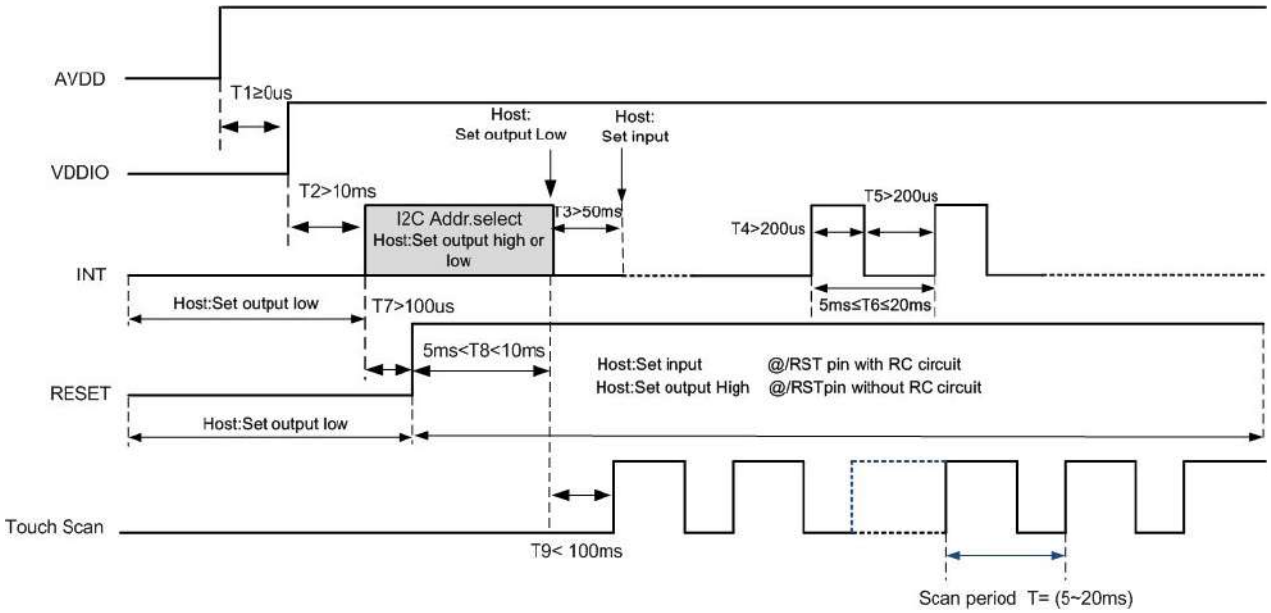
Parameter	Symbol	Min.	Max.	Unit
SCL low period	t_{lo}	1.3	-	us
SCL high period	t_{hi}	0.6	-	us
SCL setup time for START condition	t_{st1}	0.6	-	us
SCL setup time for STOP condition	t_{st3}	0.6	-	us
SCL hold time for START condition	t_{hd1}	0.6	-	us
SDA setup time	t_{st2}	0.1	-	us
SDA hold time	t_{hd2}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

测试条件 2：3.3V 通讯接口，400Kbps 通讯速度，上拉电阻 2K

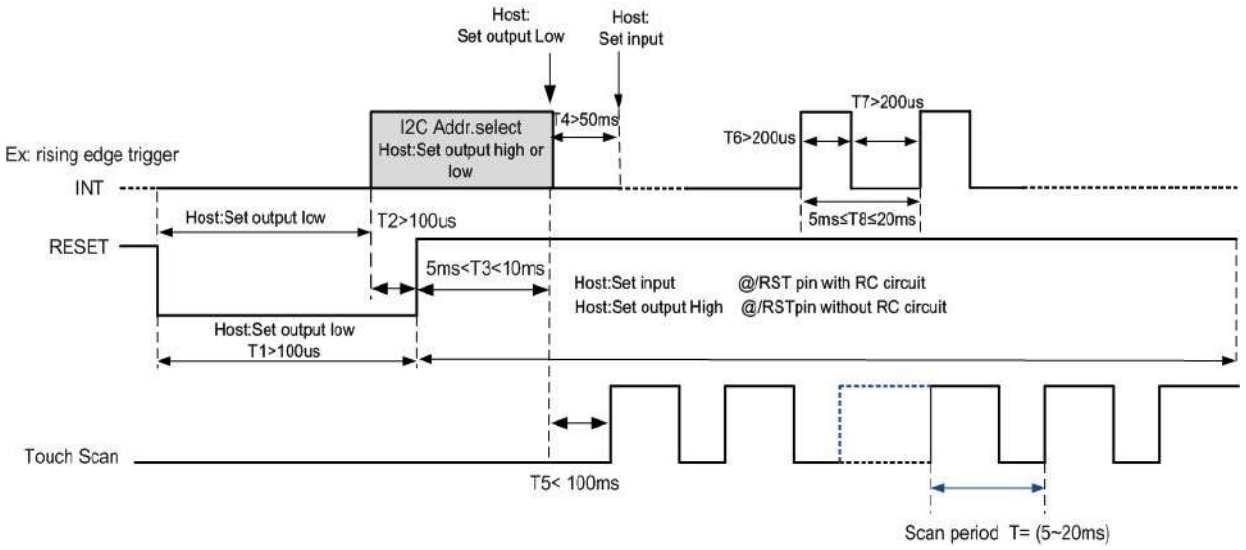
Parameter	Symbol	Min.	Max.	Unit
SCL low period	t_{lo}	1.3	-	us
SCL high period	t_{hi}	0.6	-	us
SCL setup time for START condition	t_{st1}	0.6	-	us
SCL setup time for STOP condition	t_{st3}	0.6	-	us
SCL hold time for START condition	t_{hd1}	0.6	-	us
SDA setup time	t_{st2}	0.1	-	us
SDA hold time	t_{hd2}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

GT5663 的 I²C 从设备地址有两组，分别为 0xBA/0xBB 和 0x28/0x29。主控在上电初始化时控制 Reset 和 INT 口状态进行设定，设定方法及时序图如下：

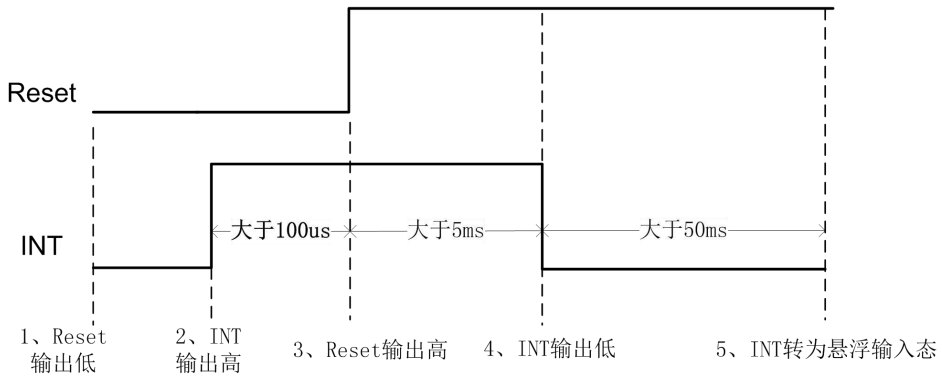
上电时序图：



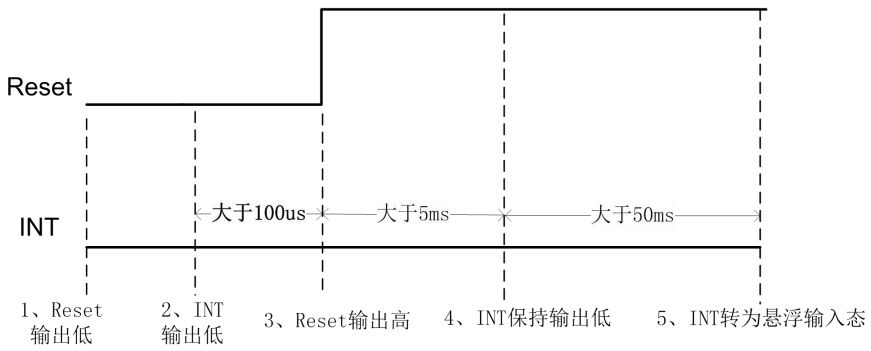
主控复位 **GT5663** 时序图：



设定地址为 **0x28/0x29** 的时序：



设定地址为 **0xBA/0xBB** 的时序：



a) 数据传输

(以设备地址为 0xBA/0xBB 为例)

通讯总是由主 CPU 发起，有效的起始信号为：在 SCL 保持为“1”时，SDA 上发生由“1”到“0”的跳变。地址信息或数据流均在起始信号之后传输。

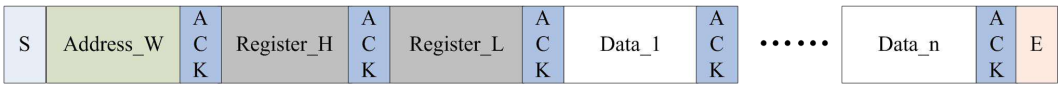
所有连接在 I²C 总线上的从设备，都要检测总线上起始信号之后所发送的 8 位地址信息，并做出正确反应。在收到与自己相匹配的地址信息时，GT5663 在第 9 个时钟周期，将 SDA 改为输出口，并置“0”，作为应答信号。若收到不与自己匹配的地址信息，即非 0XBA 或 0XBB，GT5663 将保持闲置状态。

SDA 口上的数据按 9 个时钟周期串行发送 9 位数据：8 位有效数据加 1 位接收方发送的应答信号 ACK 或非应答信号 NACK。数据传输在 SCL 为“1”时有效。

当通讯完成时，由主 CPU 发送停止信号。停止信号是当 SCL 为“1”时，SDA 状态由“0”到“1”的跳变。

b) 对 GT5663 写操作

(以设备地址为 0xBA/0xBB 为例)



写操作时序图

上图为主 CPU 对 GT5663 进行的写操作流程图。首先主 CPU 产生一个起始信号，然后发送地址信息及读写位信息“0”表示写操作:0XBA。

在收到应答后，主 CPU 发送寄存器的 16 位地址，随后是 8 位要写入到寄存器的数据内容。

GT5663 寄存器的地址指针会在写操作后自动加 1，所以当主 CPU 需要对连续地址的寄存器进行写操作时，可以在一次写操作中连续写入。写操作完成，主 CPU 发送停止信号结束当前写操作。

c) 对 GT5663 读操作

(以设备地址为 0xBA/0xBB 为例)

读操作时序图

上图为主 CPU 对 GT5663 进行的读操作流程图。首先主 CPU 产生一个起始信号，然后发送设备地址信息及读写位信息“0”表示写操作：0XBA。

在收到应答后，主 CPU 发送首寄存器的 16 位地址信息，设置要读取的寄存器地址。在收到应答后，主 CPU 重新发送一次起始信号，发送读操作：0XBB。收到应答后，主 CPU 开始读取数据。

GT5663 同样支持连续的读操作，默认为连续读取数据。主 CPU 在每收到一个 Byte 数据后需发送一个应答信号表示成功接收。在接收到所需的最后一个 Byte 数据后，主 CPU 发送“非应答信号 NACK”，然后再发送停止信号结束通讯。

7. HotKnot 模式

7.1. 启动 HotKnot

当有数据发送时，则主 CPU 下发进入主机接近检测模式命令 0x21，则该终端可以检测到与之通讯的接收端。 成功检测到另一支持 HotKnot 技术通讯终端，会以 INT 的方式告知主 CPU 关闭 LCD 后进行数据通讯。

7.2. TP 间数据传输

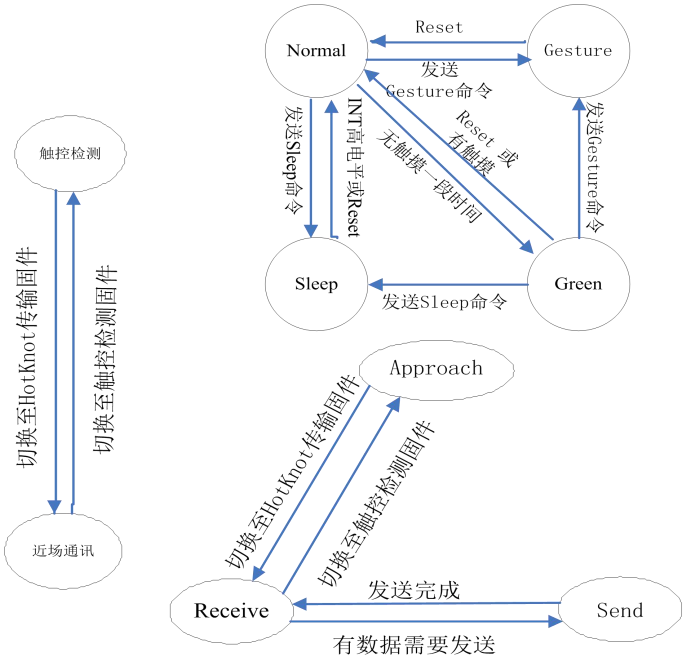
成功接近检测后，主控下发 HotKnot 的传输固件，传输固件运行后，进入数据传输模式，默认处于接收状态，即检测是否有数据从发送端发来。当 GT5663 的发送缓冲区被正确刷新，则会立即启动发送，接收方就可以检测到数据。

7.3. CPU 从 GT5663 接收数据

GT5663 发送完或接收完一帧数据，会通过翻转 INT 来通知 CPU 处理。当 GT5663 接收完一帧数据，CPU 先获取 HotKnot 的状态寄存器，当接收状态寄存器指示成功接收到一帧数据时，CPU 再去接收缓冲区将收到的数据通过 I^2C 读取上来，读取上来后再往指定地址写入 0xAA，告知 GT5663 数据读取完毕。对于发送也是一样，获取成功发送的状态后，往指定地址写入 0xAA，告知 GT5663 已处理完毕，GT5663 会自动切换至接收数据状态，直到发送缓冲区被再次刷新才会启动发送。

8. 功能描述

8.1 工作模式



a) Normal Mode

GT5663 在 Normal mode 时，最快的坐标刷新周期为 5ms-20ms 间（依赖于配置信息的设定，配置信息可控周期步进长度为 1ms）。

Normal mode 状态下，一段时间无触摸事件发生，GT5663 将自动转入 Green mode，以降低功耗。GT5663 无触摸自动进入 Green mode 的时间可通过配置信息设置，范围为 0~15s，步进为 1s。

b) Green Mode

在 Green mode 下，GT5663 扫描周期约为 40ms（默认值），若检测到有触摸动作发生，自动进入 Normal mode。

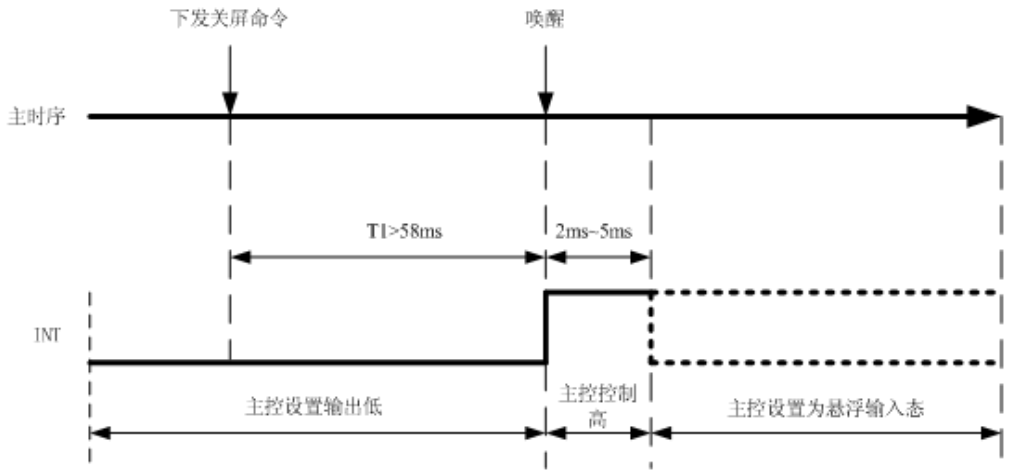
c) Gesture mode

主 CPU 通过下发 I²C 命令，让 GT5663 进入 Gesture mode 后，可通过滑动屏体、双击或者在屏体上书写特定字符实现唤醒。

在 Gesture mode 下， GT5663 检测到手指在屏体上滑动足够的长度、双击动作、书写特定字符、书写自定义字符，INT 就会输出一个 250us 左右的脉冲，主控收到脉冲后醒来亮屏。

d) Sleep Mode

主 CPU 通过 I²C 命令，使 GT5663 进入 Sleep mode（需要先将 INT 脚输出低电平）。当需要 GT5663 退出 Sleep mode 时，主机输出一个高电平到 INT 脚（主机打高 INT 脚 2~5ms），唤醒后 GT5663 将进入 Normal mode。下发 I²C 关屏命令与唤醒之间的时间间隔要求大于 58ms。



e) Approach Mode

当使能 HotKnot 接近检测功能后，GT5663 默认运行在 Approach Mode 下，当退出此模式后，主 CPU 通过下发 0x20 或 0x21 命令，使 GT5663 进入 Approach mode。该模式下，触控检测和近场的接近检测相间进行。Approach mode 在发送端与接收端模式存在区别:在发送端是会通过驱动感应通道发送约定规律约定频率的信标，发送完再检测是否收到接收端返回的约定规律约定频率的信标，以此判定有无接收端存在。在接收端，Approach mode 一直检测是否收到发送端发来的约定规律约定频率的信标，若检测到，返回约定规律约定频率的信标通知发送端。在 Approach mode 下，当发现近场范围存在可通讯终端，会以 INT 的方式通知主 CPU 来获取状态。为了保证收发双方可靠的检测到对方，当获取到接近状态后，须继续保持至少

150ms 检测，主 CPU 再下发 HotKnot 传输固件进入 Receive mode。

f) Receive Mode

在 GT5663 运行在 Approach mode 时，主 CPU 获取到 GT5663 检测到可通讯终端，主 CPU 再下发 HotKnot 传输固件使 GT5663 进入 Receive mode。在该模式下，不断地检测有无起始帧信号，检测到后，开始检测数据，接收完成后，进行校验，若校验失败，重新开始接收；若接收成功，则以 INT 方式通知主 CPU 来接收缓冲区读取数据。

g) Send Mode

在 GT5663 运行在 Receive mode 时，主 CPU 将待发数据发送至发送缓冲区，GT5663 检测到发送缓冲区被刷新且有数据需要发送时，自动从 Receive mode 切换到 Send mode。在该模式下，先发送起始帧信号，并检测到接收端有返回 ACK，再接着发送数据信号，发送完一个数据序列，开始检测 ACK；若 ACK 没有或不对，重发刚发过的字节，重发若超过五次都失败，会将本帧数据重新开始发送，直到主 CPU 超时使其退出。数据成功发送完成后，待主 CPU 处理完或超时后，自动切换到 Receive mode。

8.2 中断触发方式

当有触摸时，GT5663 每个扫描周期均会通过 INT 脚发出脉冲信号，通知主 CPU 读取坐标信息。主 CPU 可以通过相关的寄存器位“INT”来设置触发方式。设为“0”表示上升沿触发，即在有用户操作时，GT5663 会在 INT 口输出上升沿跳变，通知 CPU；设为“1”表示下降沿触发，即在有用户操作时，GT5663 会在 INT 口输出下降沿跳变。

8.3 睡眠模式

当显示屏熄灭时或在其他不需要操作触摸屏的状态下，可以通过 I^2C 命令使 GT5663 进入 Sleep mode 以降低功耗。当需要 GT5663 正常工作时，主控将 INT 口输出一段时间的高电平将其唤醒。主控控制 GT5663 进入睡眠状态和退出睡眠状态时序，具体时序请参考第 8.1 节。

8.4 跳频功能

GT5663 拥有很好的硬件抗干扰基础，当 GT5663 的驱动频谱与干扰信号的峰值频谱叠加时，可通过自适应跳频机制来切换到另一个频率，从而避开干扰。

8.5 自动校准

a)初始化校准

不同的温度、湿度及物理空间结构均会影响到电容传感器在闲置状态的基准值。GT5663 会在初始化的 200ms 内根据环境情况自动获得新的检测基准。完成触摸屏检测的初始化。

b)自动温漂补偿

温度、湿度或灰尘等环境因素的缓慢变化，也会影响到电容传感器在闲置状态的基准值。GT5663 实时检测各点数据的变化，对历史数据进行统计分析，由此来修正检测基准。从而降低环境变化对触摸屏检测的影响。

8.6 Gesture 模式驱动修改

➢ 灭屏后进入 Gesture 模式

1) 按电源键（或其他按键）关屏时，往 0x8040 下发命令 8；

2) 手机自动灭屏时的修改与按电源键（或其他按键）关屏时的修改一致；

3) 在灭屏的过程中，滑动、双击屏体或书写特定字符 INT 会输出一个 250us 左右的脉冲，主控收到脉冲后读取 0x814B 的值，如满足唤醒条件则复位 5663 并醒来亮屏，否则清零 0x814B 等待下一次脉冲。

➢ 灭屏后进入 Sleep 模式

1) 按电源键（或其他按键）关屏时，往 0x8040 下发命令 5；

2) 手机自动灭屏时的修改与按电源键（或其他按键）关屏时的修改一致；

3) 此模式下只能通过电源键（或 home 键）唤醒。

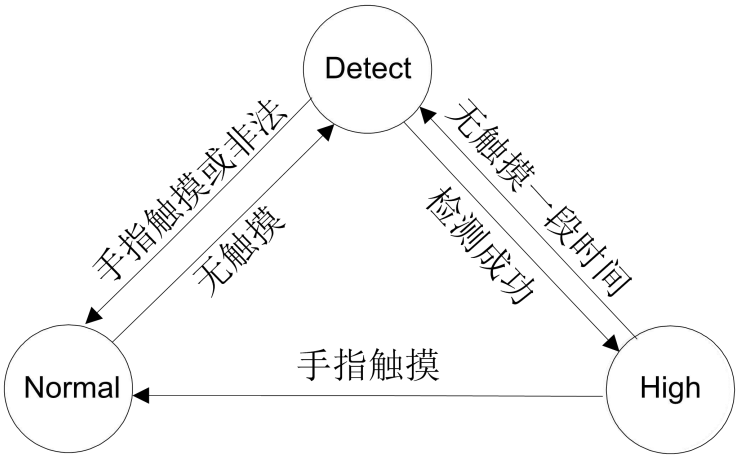
➢ 按电源键（或 home 键）开屏

任何模式下按开屏键（或 home 键）开屏，直接按照复位时序复位 IC，执行复位流程。

➢ 建议可与 IR 配合

如果可以用 IR 来配合，灭屏时当 IR 检测到有物体遮挡，可进入原 sleep 模式，使耗电更少；检测无遮挡则进入手势唤醒模式，进入不同模式的方法同上所述（需复位再下发命令）。

8.7 灵敏度状态切换



a) Normal 状态(正常灵敏度)

在 Normal 状态下，使用较高的触摸阈值识别触摸信号来定位触摸位置，以减小噪声的干扰，该状态下仅支持手指触摸。

b) High 状态（高灵敏度）

在 High 状态下。使用较低的触摸阈值识别触摸信号来定位触摸位置，该状态支持手套以及被动笔的触摸。在该状态下一旦检测到手指触摸，就退回到 Normal 状态。

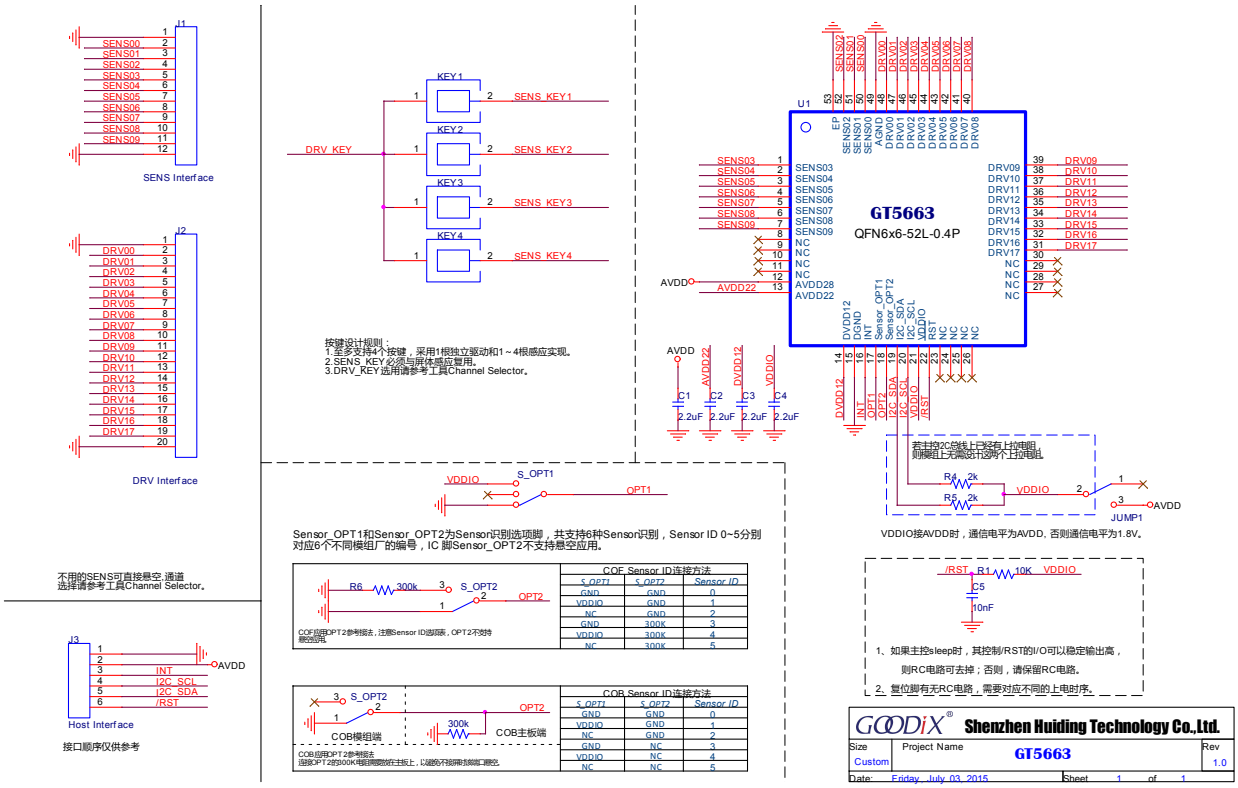
c) Detect 状态

Normal 状态下无触摸或者 High 状态下无触摸一段时间，GT5663 将自动转入 Detect 状态。在 Detect 状态时检测到手指触摸或多个弱信号触摸，则会切换到 Normal 状态；在 Detect 状态时检测到单个弱信号发生滑动或者连续两次点击动作，则进入到 High 状态。在 Detect 状态下不进行坐标上报。

d) 手套材质

因为从不同材质到不同厚度，市面上手套各式各样。由于差异较大，在这里针对手套的材质及厚度做一个适应性说明，从手套表层材质来看金属、皮革效果较好，毛质、尼龙、棉效果次之。从厚度上来看金属、皮革材质支持的厚度较大，毛质、尼龙、棉支持的厚度较薄。

9. 参考电路图



GT5663 参考应用电路图

注：

1) 本电路仅表示基本应用方式，实际或根据应用环境需要对部分电路进行调整。

2) 电容建议采用 X7R 材质。

10. 电气特性

10.1 极限电气参数

参数	最小值	最大值	单位
模拟电源 AVDD28（参考 AGND）	-0.3	4.2	V
VDDIO（参考 DGND）	-0.3	4.2	V
数字 I/O 可承受电压	-0.3	4.2	V
模拟 I/O 可承受电压	-0.3	4.2	V
工作温度范围	-20	85	℃
存储温度范围	-60	125	℃
ESD 保护电压（HB Model）	±4		kV

10.2 推荐工作条件

参数	最小值	典型值	最大值	单位
AVDD28	2.8	-	3.3	V
VDDIO	1.8	-	AVDD28	V
工作温度	-20	25	85	℃

10.3 AC 特性

（环境温度为 25℃，AVDD28=2.8V，VDDIO=1.8V）

参数	最小值	典型值	最大值	单位
OSC 振荡频率	63.36	64.0	64.64	MHz
I/O 输出由低到高转换时间	-	12.5@20pf	-	ns
I/O 输出由高到低转换时间	-	8.5@20pf	-	ns

10.4 DC 特性

（环境温度为 25℃，AVDD28=2.8V，VDDIO=1.8V 或 VDDIO=AVDD28）

参数	最小值	典型值	最大值	单位
Normal mode 工作电流	-	17	-	mA
Green mode 工作电流	-	5	-	mA
Sleep mode 工作电流	39	-	135	uA
数字输入为低电平电压值/VIL	-0.3		0.25*VDDIO	V
数字输入为高电平电压值/VIH	0.75*VDDIO		VDDIO+0.3	V
数字输出为低电平电压值/VOL			0.15*VDDIO	V
数字输出为高电平电压值/VOH	0.85*VDDIO			V

11. SMT 回流焊要求

11.1 潮湿敏感等级

GT5663 为 3 级防潮（MSL3），其要求为：

1) 在真空包装中的有效保存时间:在正常电子元器件保存条件下为 12 个月；存储环境条件：温度<40℃,相对湿度<90%R.H

2) 在真空包装被打开后,如果器件是用于红外回流设备或同等条件处理(温度不超过 260℃),必须要符合以下条件:

   a) 168 小时内上线生产 （工厂环境为≤30℃/60%R.H)

   b) 在≤10%R.H 条件下保存 （例如在干燥柜中保存）

3) 在以下条件下,器件上线生产前需要进行烘干处理:

   a) 在 23±5℃时,湿度指示卡显示＞20%

   b) 不符合 2a 或 2b

4) 如果器件需要烘干处理,烘干时间为

   a) 如密封包装内是低温器件(例如卷带包装的产品),40℃+5℃/-0℃＜5%R.H 条件下烘干 192 小时

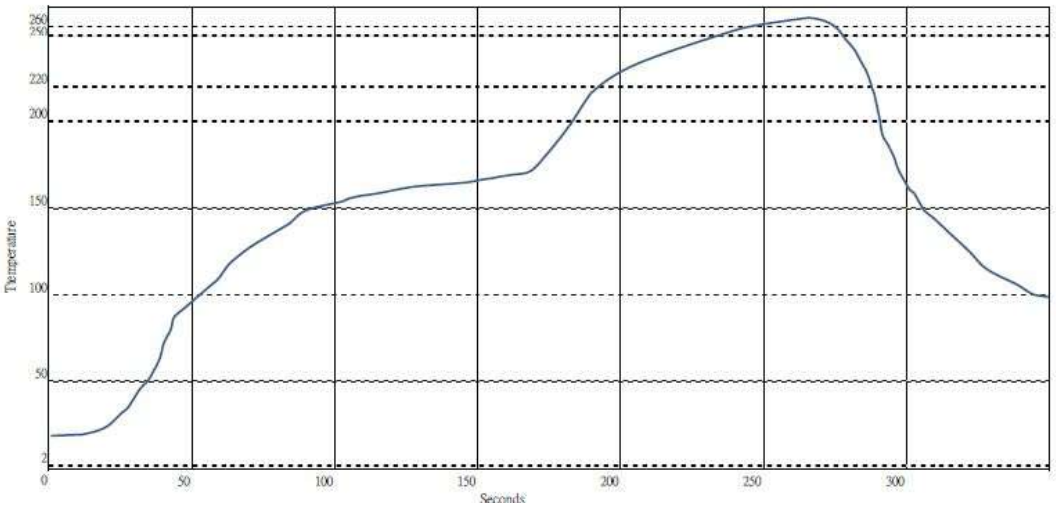
   b) 如密封包装内是高温器件（例如托盘包装的产品）,在 125℃+5/-0℃条件下烘干 24 小时

   c) 烘烤完成后，冷却后需立即装入真空袋。卷带真空袋包装放入不小于 5 克干燥剂和一张 6 点式湿度指示卡并抽真空密封保存;托盘真空袋包装放入不小于 10 克干燥剂和一张 6 点式湿度指示卡并抽真空密封保存。

11.2 回流焊次数

回流焊次数≤3 次。

11.3 无铅回流曲线示意图说明



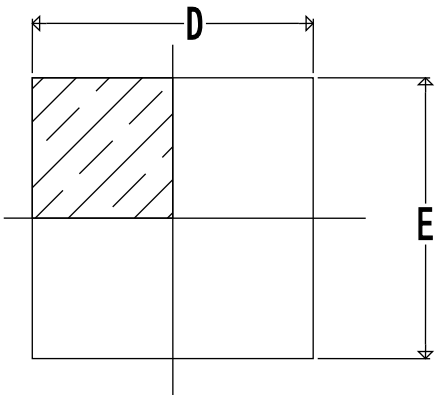
依照 J-STD-020D-01，汇顶 QFN 系列芯片无铅（Pb-Free）回流温度曲线说明见下表格。

<table>
<tr><th colspan="4">区间</th><th colspan="3">无铅制程时间参数（参考）</th></tr>
<tr><td rowspan="6">常温到峰值温度阶段</td><td rowspan="2" colspan="2">A预热区
(25℃~150℃)</td><td>维持时间</td><td colspan="2">80S~120S</td><td rowspan="6">常温到峰值温度阶段的时间不超过8分钟</td></tr>
<tr><td>升温斜率</td><td colspan="2"><3℃/s</td></tr>
<tr><td rowspan="2" colspan="2">B 恒温区
(150℃~200℃)</td><td>维持时间</td><td colspan="2">60S~120S
(汇顶建议 100S)</td></tr>
<tr><td>升温斜率</td><td colspan="2"><1℃/s</td></tr>
<tr><td rowspan="4">217℃以上阶段</td><td rowspan="2">C 217℃~260℃</td><td>维持时间</td><td>60S~85S</td><td rowspan="4">217℃以上建议维持时间在60S~150S之间</td></tr>
<tr><td>升温斜率</td><td><3℃/s</td></tr>
<tr><td>D 极温区 255℃~260℃</td><td>维持时间</td><td>20S~30S</td></tr>
<tr><td rowspan="2">E 260℃~217℃</td><td>维持时间</td><td>60S~75S</td><td rowspan="2">--</td></tr>
<tr><td>--</td><td>降温斜率</td><td><6℃/s</td></tr>
<tr><td>--</td><td colspan="2">F217℃以下冷却区</td><td>降温斜率</td><td colspan="2">1℃/s~3℃/s</td><td>--</td></tr>
</table>

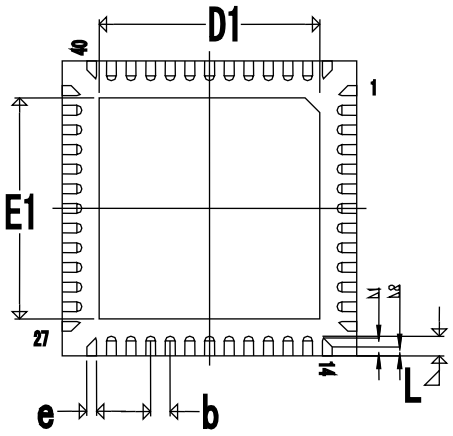
注：请按照 J-STD-020D-01 标准执行。

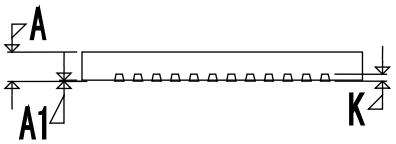
12. 产品封装

TOP VIEW



BOTTOM VIEW





SIDE VIEW

QFN 6 X 6 52PIN
0.4 PITCH SQUARE

Symbol	Dimensions In Millimeters		
	Min.	Normal	Max.
A	0.50	0.55	0.60
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		

13. 版本记录

文件版本	修改时间	修订
Rev.00	2015-05-15	预发布版
Rev.01	2015-10-13	发布版

14. 联系方式

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