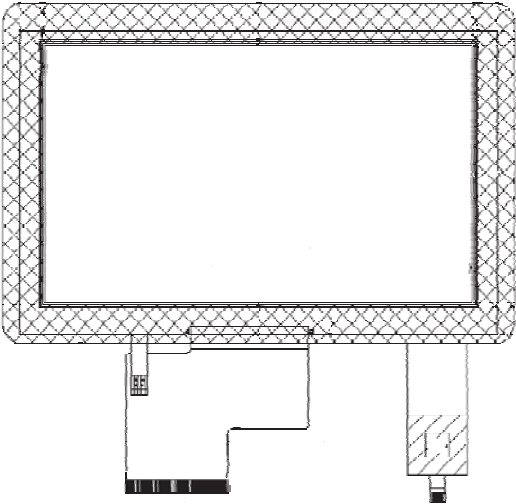




PRODUCT SPECIFICATION

HDA500PT-1S

5", TFT WVGA (800X480) COLOR  
LCD DISPLAY MODULE



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## 1. General Specifications

No	Item	Contents	Unit
1	Size	5.0	inch
2	Resolution	800RGB*480	
3	Interface	RGB	
4	Color Depth	16M	
5	Technology Type	a-Si TFT active matrix	
6	Dot Pitch	0.045*0.135	mm
7	Pixel Arrangement	RGB Stripe	
8	Display Mode	Transmissive	
9	Viewing Direction	12:00 (6 o'clock Gray Inversion)	o'clock
10	LCM (W x H x D)	129.0*85.8	mm
11	Active Area (W x H)	108.0*64.8	mm
12	With/Without CTP	With CTP	

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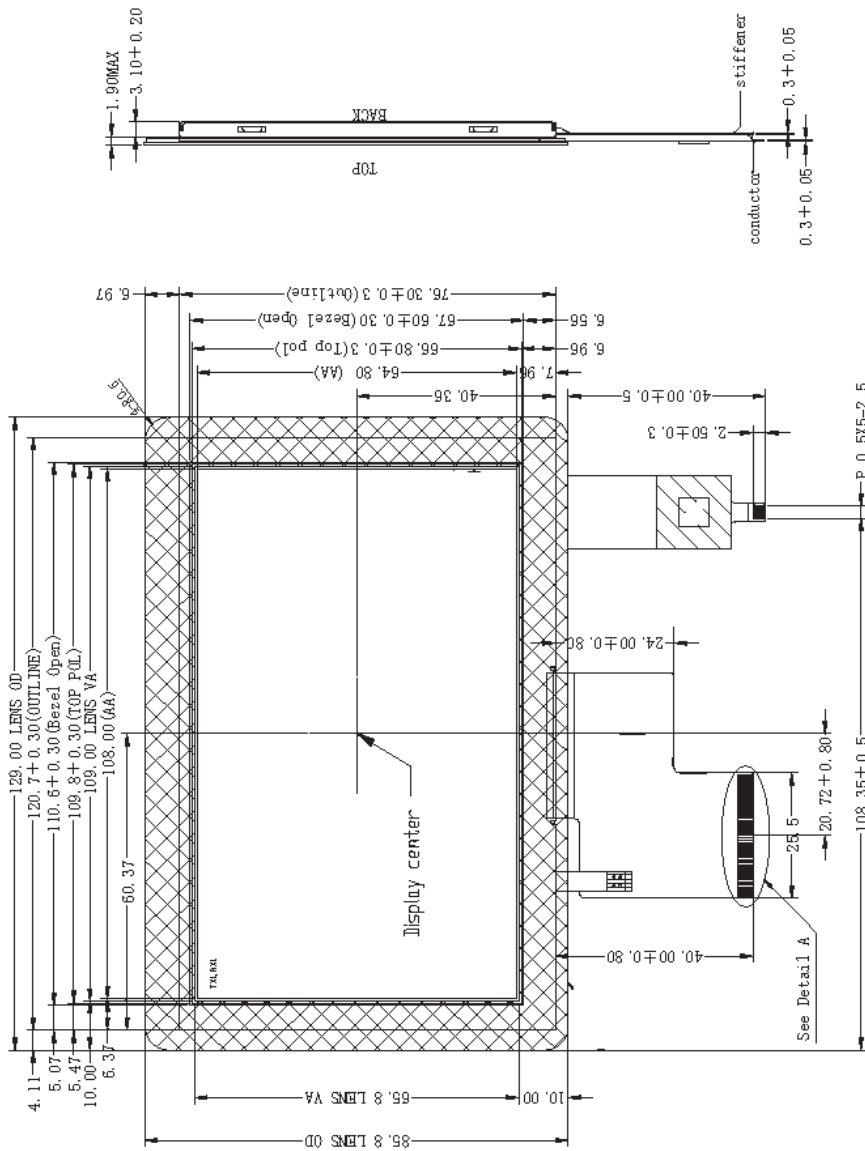
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PIN	SYMBOL	PIN	SYMBOL
1	V	26	G1
2	V	27	G0
3	V	28	R7
4	V	29	R6
5	GND	30	R5
6	V	31	R4
7	DW	32	R3
8	MODE	33	R2
9	DE	34	R1
10	VS	35	R0
11	HS	36	GND
12	R7	37	DCLK
13	R6	38	GND
14	R5	39	L/R
15	R4	40	U/D
16	R3	41	V
17	R2	42	V
18	R1	43	AV
19	R0	44	RESET
20	G7	45	NC
21	G6	46	V
22	G5	47	DITHB
23	G4	48	GND
24	G3	49	NC
25	G2	50	NC

1	2	3	4	5	6
RESET	SMA	VDD	GND	SCL	INT

1	Operating Voltage:	$V_{DD} = 3.3V$ typ.
2	Resolution:	800RGB*480
3	Color:	16M
4	Interface:	RGB
5	Display type:	Transmissive
6	Viewing Direction:	12:00 (6 o'clock Gray Inversion)
7	Operating Temp:	-20°C~70°C
8	Storage Temp:	-30°C~80°C

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### 3. PIN Assignment

Pin No	Symbol	I/O	Function	Remark
1-2	V <sub>LED+</sub>	P	LED backlight anode	
3-4	V <sub>LED-</sub>	P	LED backlight cathode	
5	GND	P	Power ground	
6	V <sub>COM</sub>	I	Common voltage	
7	DV <sub>DD</sub>	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13~18	B6~B1	I	Blue data	
19	B0	I	Blue data(LSB)	
20	G7	I	Green data(MSB)	
21~26	G6~G1	I	Green data	
27	G0	I	Green data(LSB)	
28	R7	I	Red data(MSB)	
29~34	R6~R1	I	Red data	
35	R0	I	Red data(LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample clock	
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	
40	U/D	I	Up/down selection	
41	V <sub>GH</sub>	P	Gate ON Voltage	
42	V <sub>GL</sub>	P	Gate OFF Voltage	
43	AV <sub>DD</sub>	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	
45	NC	-	No connection	
46	V <sub>COM</sub>	I	Common Voltage	
47	DITHB	I	Dithering function	
48	GND	P	Power Ground	
49-50	NC	-	No connection	

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## CTP PIN TABLE

Pin No	Symbol	I/O	Function	Remark
1	RESET	I	Reset signal	
2	SDA	I	Serial data input	
3	VDD	P	Power supply	
4	GND	P	Ground	
5	SCL	I	Serial clock	
6	INT	I	External interrupt to the host	

### 4. Absolute Maximum Rating

AGND = GND = 0V, Ta = 25° C

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	DV <sub>DD</sub>	-0.3	5	V	
	AV <sub>DD</sub>	-0.5	13.5	V	
	VGH	-0.3	42	V	
	VGL	-20	0.3	V	
Backlight Forward Current	I <sub>LED</sub>		-	mA	For each LED
Operating Temperature	T <sub>OPR</sub>	-20	70	° C	
Storage Temperature	T <sub>STG</sub>	-30	80	° C	

The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

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## 5. Electrical Characteristics

### 5.1. Recommended Operating Condition

AGND = GND = 0V, Ta = 25° C

Item	Symbol	Min	Typ.	Max	Unit	Remark
Power Voltage	DV <sub>DD</sub>	3.0	3.3	3.6	V	
	AV <sub>DD</sub>	10.2	10.4	10.6	V	
	VGH	15.3	16.0	16.7	V	
	VGL	-6.7	-6.0	-5.3	V	
Input signal voltage	V <sub>COM</sub>	3.09	4.09	5.09	V	
Input logic high voltage	V <sub>IH</sub>	0.7 DV <sub>DD</sub>	-	DV <sub>DD</sub>	V	
Input logic low voltage	V <sub>IL</sub>	0	-	0.3DV <sub>DD</sub>	V	

### 5.2. Recommended Driving Condition for Backlight

Ta = 25° C

Item	Symbol	Min	Typ.	Max	Unit	Remark
Forward Voltage	V <sub>f</sub>	19.6	21.7	23.8	V	
Forward Current	I <sub>f</sub>	36	40	44	mA	
Operating Life Time	-	20000			Hours	

Note 1: The LED supply voltage is defined by the number of LED at Ta=25°C and I<sub>f</sub>=40 mA.

Note 2: The "Operating Life Time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and I<sub>f</sub>=40 mA. The LED lifetime could be decreased if operating I<sub>f</sub> is larger than 40 mA.

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## 6. Timing Characteristics

### 6.1. AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	-	-	ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
VS setup time	$T_{vst}$	8	-	-	ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8	-	-	ns	
Data hole time	$T_{dhd}$	8	-	-	ns	
DE setup time	$T_{esu}$	8	-	-	ns	
DE hole time	$T_{ehd}$	8	-	-	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	1	-	-	ms	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	



## 6.2.Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fcik	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

## 6.3.Data Input Format

### Horizontal input timing diagram



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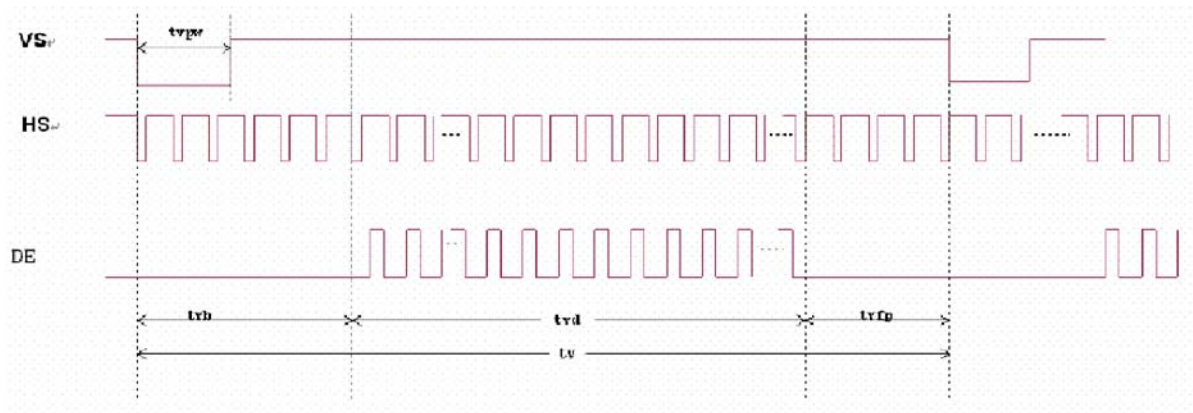
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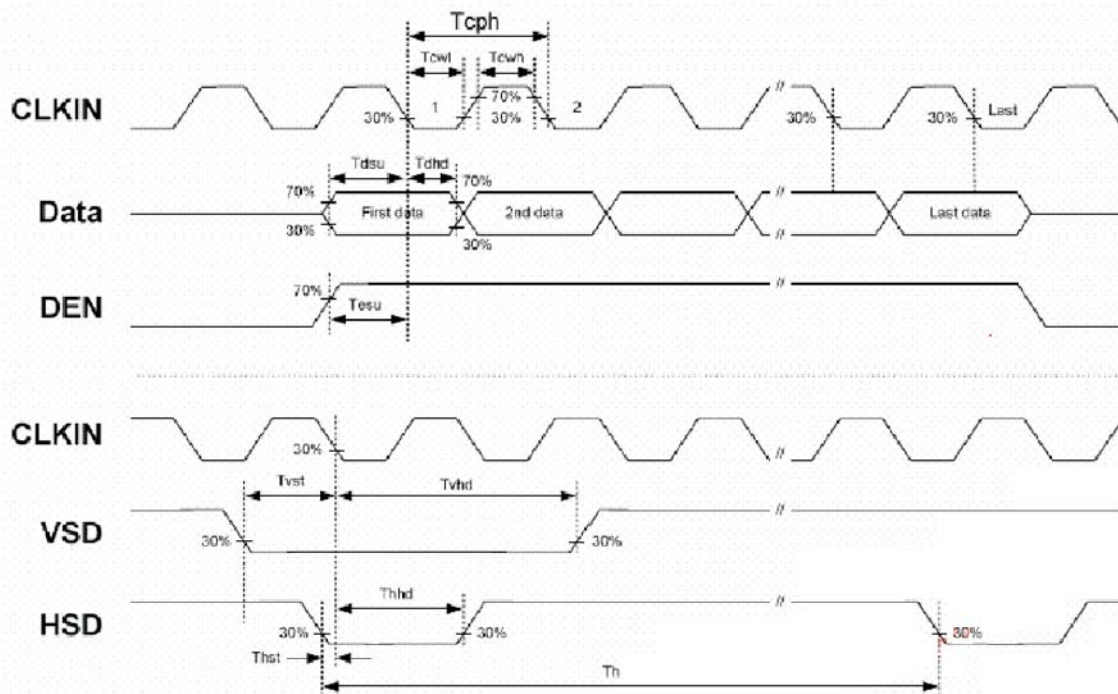
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## Vertical input timing diagram.

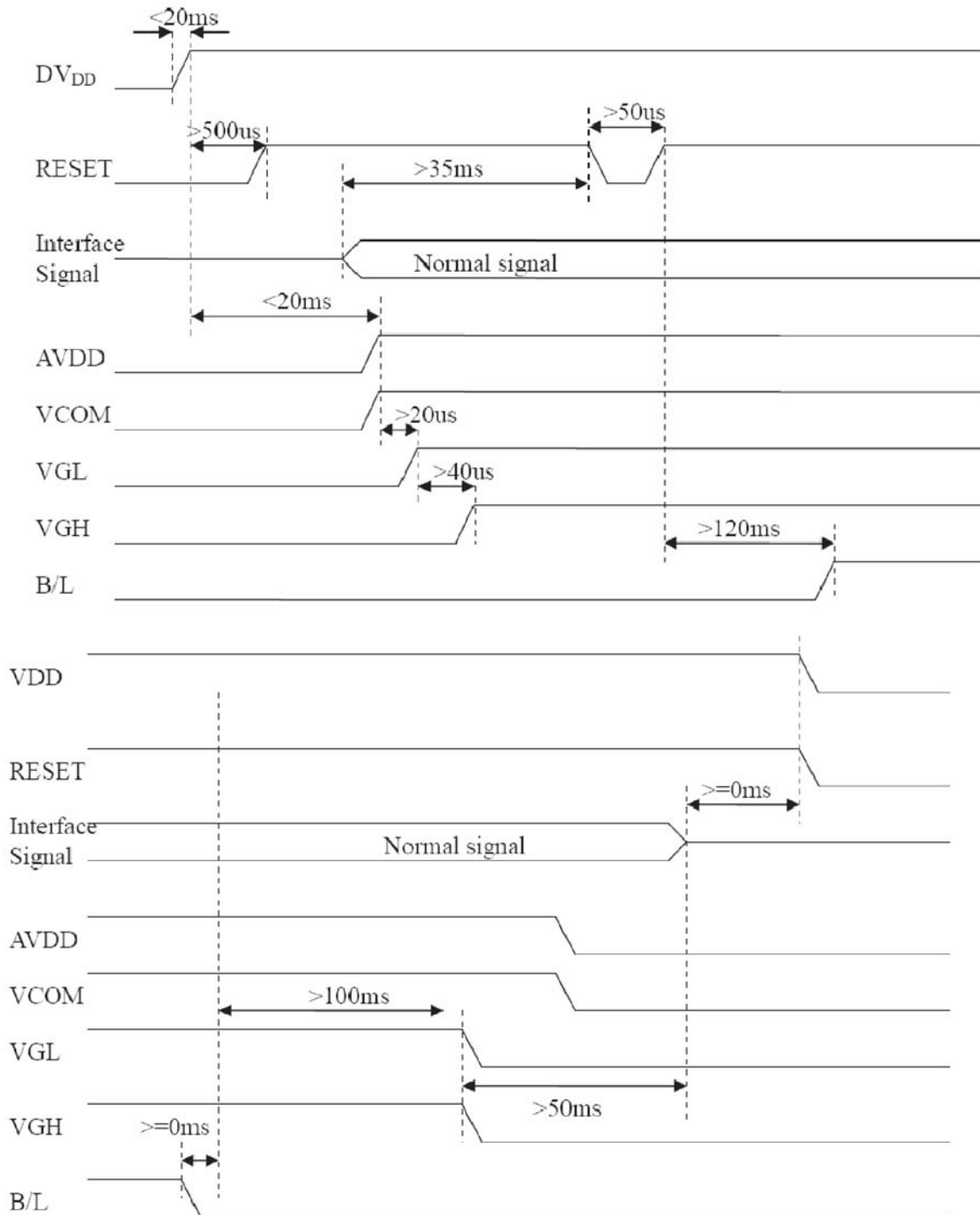


## 6. 4. Input Clock and Data Timing Diagram



## 6.5. Power ON/OFF Sequence

### Power on sequence:



## 7. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	$\theta T$	$CR \geq 10$	40	50	-	Degree	Note 2
	$\theta B$		60	70	-		
	$\theta L$		60	70	-		
	$\theta R$		60	70	-		
Contrast Ratio	CR	$\theta = 0^\circ$	400	500	-		Note 1 Note 3
Response Time	$T_{ON}$	25° C	-	10	20	ms	Note 1
	$T_{OFF}$		-	15	30		Note 4
Chromaticity	$W_x$	x	0.26	0.31	0.36		Note 1
	$W_y$	y	0.28	0.33	0.38		Note 5
Uniformity	U		70	75	-	%	Note 5
Luminance	L		240	300	-	cd/m <sup>2</sup>	Note 1 Note 5

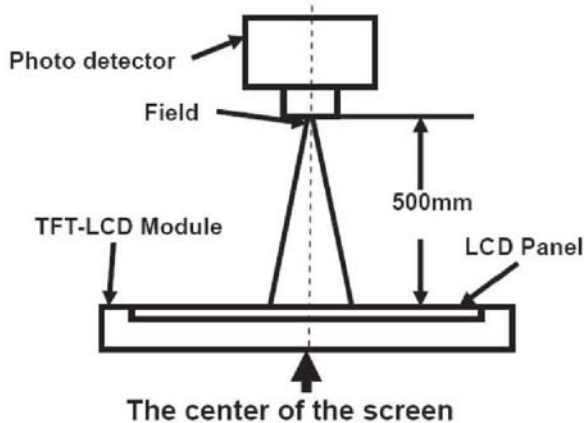
Test Conditions:

1.  $I_f=40$  mA(Backlight current),  $DV_{DD} = 3.3$  V,the ambient temperature is 25° C.
2. The test systems refer to Note 2.

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Note 1: Definition of optical measurement system.

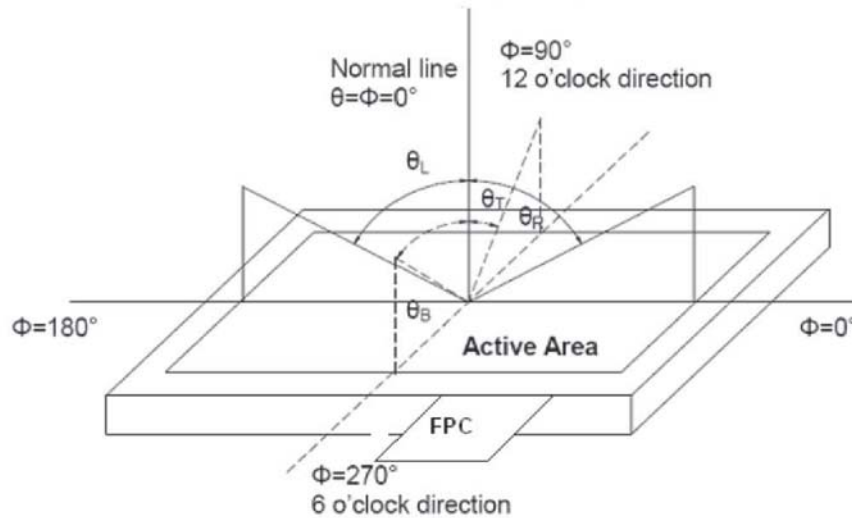
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	
Response Time	TRD100	-

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

"White state ": The state is that the LCD should drive by  $V_{white}$ .

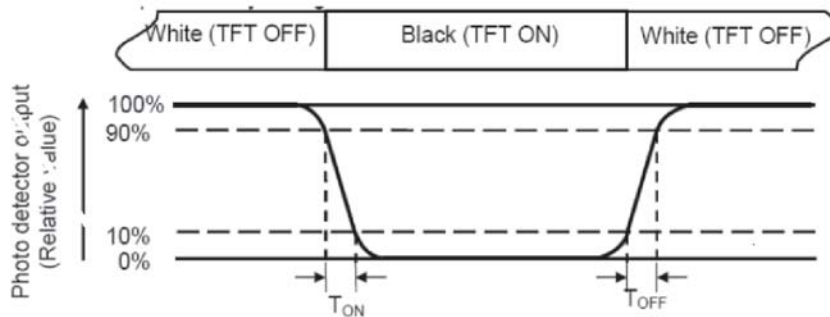
"Black state": The state is that the LCD should drive by  $V_{black}$ .

$V_{white}$ : To be determined     $V_{black}$ : To be determined.

Note 4: Definition of Response time

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The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

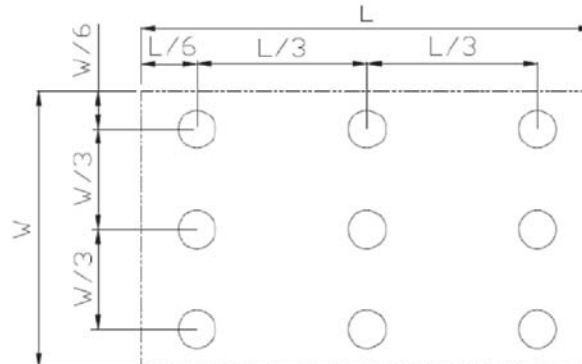
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

L-----Active area length W----- Active area width



$L_{\max}$ : The measured Maximum luminance of all measurement position.

$L_{\min}$ : The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

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## 8. Environmental/Reliability Test

No.	Test Item	Test Condition	Inspection after test
1	High Temperature Storage	80±2°C/240 hours	Inspection after 2~4hours storage at room temperature,the sample shall be free from defects: 1.Air bubble in the LCD; 2.Sealleak; 3.Non-display; 4.missing segments; 5.Glass crack; 6.Current Idd is twice higher than initial value.
2	Low Temperature Storage	-30±2°C/240 hours	
3	High Temperature Operating	70±2°C/240 hours	
4	Low Temperature Operating	-20±2°C/240 hours	
5	Temperature Cycle	-20°C~ 25°C~ 70°C × 10cycles (30min.) (5min.) (30min.)	
6	Damp Proof Test	60°C±5°C×90%RH/240 hours	
7	Vibration Test	Frequency: 10Hz~55Hz~10Hz Amplitude: 1.5mm, X, Y, Z direction for total 3hours (Packing condition)	
8	Dropping test	Drop to the ground from 1m height, one time, every side of carton. (Packing condition)	
9	ESD test	± 2KV, Human Body Mode, 100pF/1500 Ω	

**Remark:**

- 1.The test samples should be applied to only one test item.
- 2.Sample size for each test item is 5~10pcs.
- 3.For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
- 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
- 5.EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
- 6.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.
- 7.Please use automatic switch menu(or roll menu) testing mode when test operating mode.

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## 10. Standard Specifications For Product Quality

### 10.1. Manner of test:

10.1.1 The test must be under 40W fluorescent light, and the distance of view must be at 30±10cm.

10.1.2 Room temperature 25±5°C Humidity: (60±10)%RH.

### 10.2. Quality specification

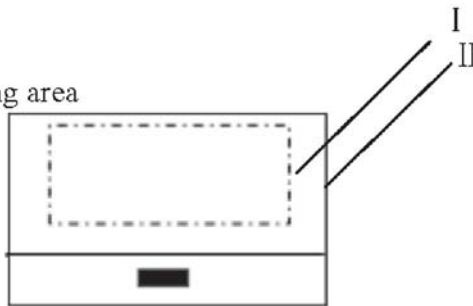
It shall be based on GB2828-87, inspection level II .

	IETM	CHECK LEVEL	AQL
MAJOR (MA)	1.Liquid crystal leakage 2.Wrong polarizer 3.Outside dimension 4. Bright dot、 Dark dot 5. Display abnormal 6. Class crack	II	0.25
MINOR (MI)	1. Spot Defect (Including black spot、 white spot、 pinhole、 foreign particle、 bubbles、 hurt) 2. fragment 3. Line Defect (Including black line、 white line、 cratch) 4. Incision defect 5. Newton's ring 6. Other visual defects	II	1.0

### 10.3. Definition of area:

10.3.1 I area: viewing area

II area: outside viewing area



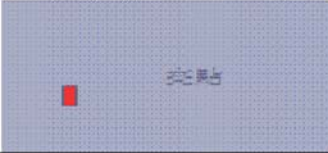
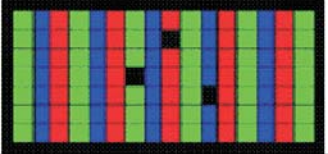
### 10.4. Standard of appearance test for I area: (unit: mm)

NOTE: Defect ignore for II area .

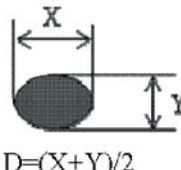
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### 10.4.1 Bright/Dark Dots explain

Name	Explain	Definition
Bright dot	Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern 	The definition of dot: The size of a defective dot over 1/2 of single pixel dot is regarded as one defective dot. NOTE: One pixel consists of 3 sub-pixels, including R, G, and B dot. (Sub-pixel = Dot)
Dark dot	Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern. 	
ADJACENT DOT	Adjacent two sub-pixel are defect (define two dot defect)	

### 10.4.2 Inspection standard

N <sub>2</sub>	Items	Criterion		Checking Manner	Defect Classes
1	Bright/dark dot	Under 6" (contain 6")	Bright dot: 2 Dark dot: N≤4 <b>Note:</b> be more than 5mm apart	Checking with eyes	MAJ
		6"-12"	Bright dot: N≤4 Dark dot: N≤5 Total Bright and Dark Dots: N≤8 <b>Note :</b> 1. Two bright dot defects (red, green, blue, and white) should be larger than 15mm; 2. The distance between black dot defects or black and bright dot defects should be more than 5mm apart.		
2	Spot Defect (Including black spot, white spot, Pinhole, foreign particle, bubbles, hurt)  $D=(X+Y)/2$	Under 6" (contain 6")	D≤0.1 Ignore 0.1<D≤0.35 N≤3 0.35<D N=0	Checking with eyes	MIN
		6"-12"	D≤0.3 Ignore 0.3<D≤0.6 N≤4 0.6<D N=0		

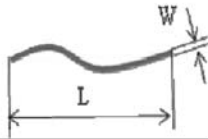
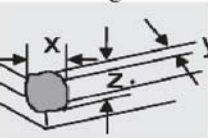
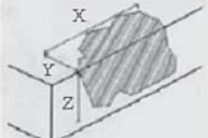
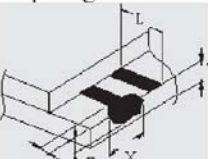
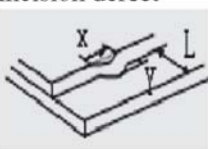
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No	Items	Criterion		Checking manner	Defect classes
3	Line Defect (Including black Line.white line. scratch) 	Under 6" (contain 6")	$W \leq 0.02$ Ignore $0.02 < W \leq 0.04$ $L \leq 5$ $N \leq 2$ $0.04 < W \leq 0.06$ $L \leq 5$ $N \leq 1$ $W > 0.06$ $N = 0$	Checking with eyes	MIN
		6"-12"	$W \leq 0.07$ Ignore $0.07 < W \leq 0.1$ $L \leq 10$ $N \leq 4$ $W > 0.1$ $N = 0$		
4	Display abnormal	Not allowed		Checking with eyes	MAJ
5	Outside dimension	Accord with drawing		Callipers	MAJ
6	Class crack	Not allowed		Checking with eyes	MAJ
7	Leak	Not allowed		Checking with eyes	MAJ
8	Comer fragment 	$X \leq 3$ $Y \leq 3$ $Z \leq T$ Ignore Note : 1.No hurt identifying .wire.seal 2.T: Glass thickness X: Length Y: Width Z: thickness		Checking with eyes	MIN
9	Side fragment 	$Y \leq 1$ $Z \leq T$ Ignore Note : 1.No hurt identifying .wire.seal 2.T: Glass thickness X: Length Y: Width Z: thickness		Checking with eyes	MIN
	Step fragment 	$Y \leq 1$ and $Y \leq 1/4 L$		Checking with eyes	MIN
	Incision defect 	$Y \leq 1$ and accord with outside dimension		Checking with eyes	MIN

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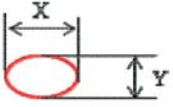
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№	Items	Criterion		Checking manner	Defect classes
10	Newton's ring (CTP or Cover board)  $D=(X+Y)/2$	Under 6" (contain 6")	$D \leq 25 \quad N \leq 3$ $D > 25 \quad N = 0$	Checking with eyes	MIN
	6"-12"	$D \leq 70 \quad N \leq 5$ $D > 70 \quad N = 0$			

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## PRODUCT DESCRIPTION

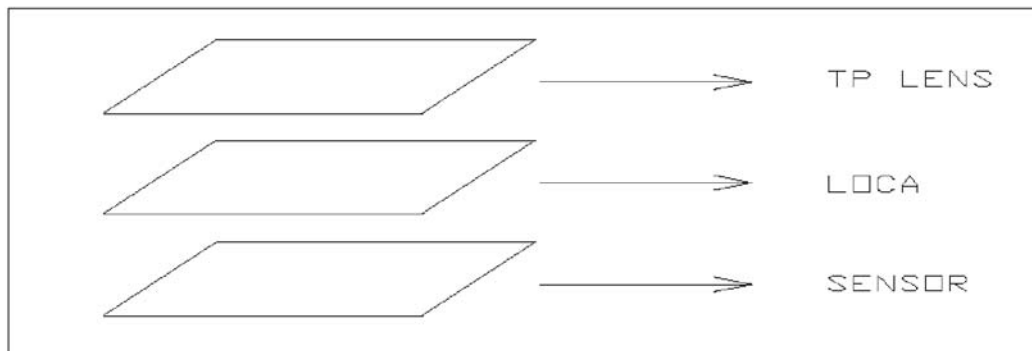
### General Description

Product type	Projected capacitive Touch Panel
Product structure	Glass lens +Glass sensor
Product Size	5.0" (A. A)
Resolution	800*480
Operation temperature	-20℃~70℃
Storage temperature	-30℃~80℃
Control IC	FT5336
Sensor Channel	TX20,RX12
Lens surface hardness	6H

### ● Mechanical Description

Item	Standard Value	Unit
TP outline dimension	129.0 (W) *85.8 (H) *1.9 (T)	mm
TP view area	109.0 (W) *65.8 (H)	mm
sensor outline dimension	120.7 (W) * 72.33 (H)	mm
sensor active area	109.6 (W) *66.4 (H))	mm

### ● Structure Description



### ● Communication Interface

I/O Voltage	3.3V
Multi-touch max points	5Points
INT Mode	External interrupt
Communication interface/address	0x70(8 bit)
SCL frequency	100K-400K

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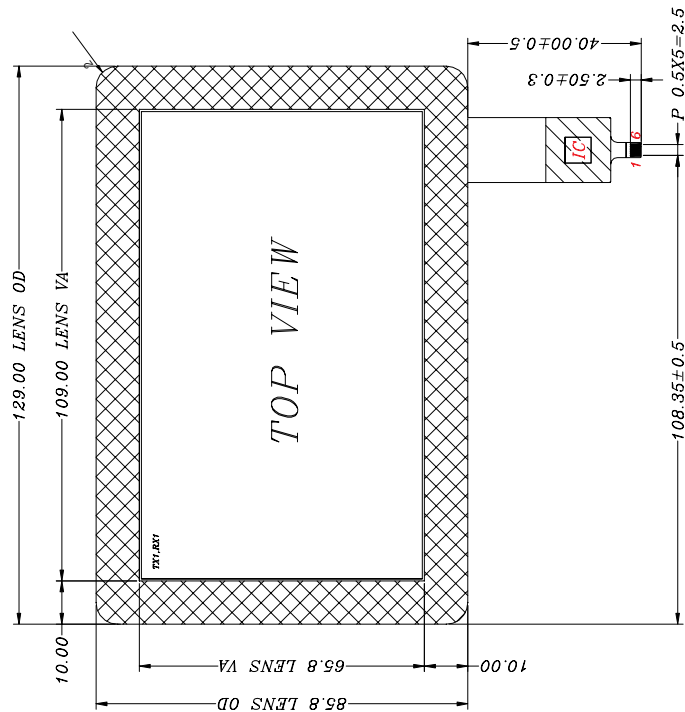
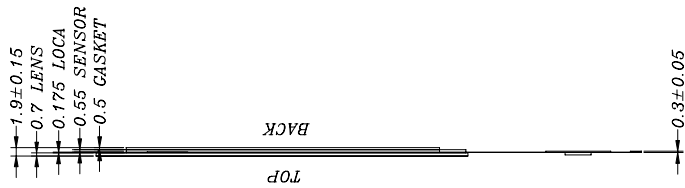
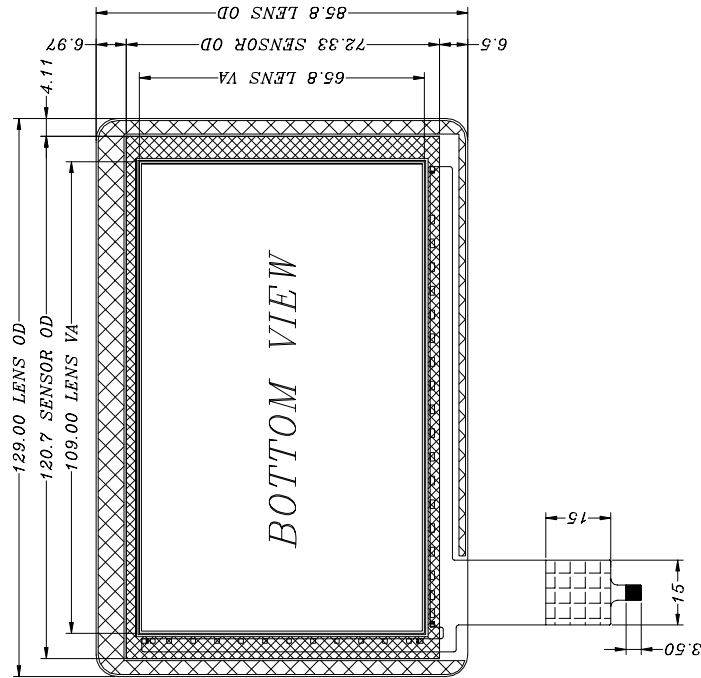
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1	2	3	4	5	6
VCC	SCL	SDA	RESET	INT	GND

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# HOST INTERFACE

Figure shows the interface between a host processor and FT5336GQQ. This interface consists of the following three sets of signals:

- Serial Interface
- Interrupt from FT5336GQQ to the Host
- Reset Signal from the Host to FT5336GQQ

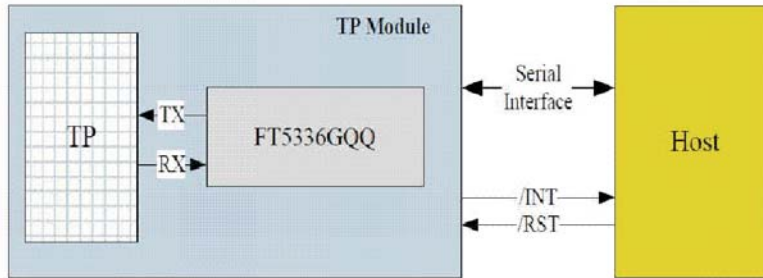


Figure Host Interface Diagram

The serial interface of FT5336GQQ is I2C. The detail of the interface is described in detail in Section 2.5. The interrupt signal (/INT) is used for FT5336GQQ to inform the host that data are ready for the host to receive. The /RST signal is used for the host to wake up FT5336GQQ from the Hibernate mode. After resetting, FT5336GQQ shall enter the Active mode.

## Serial Interface

FT5336GQQ supports the I2C interfaces, which can be used by a host processor or other devices.

The I2C is always configured in the Slave mode. The data transfer format is shown in Figure

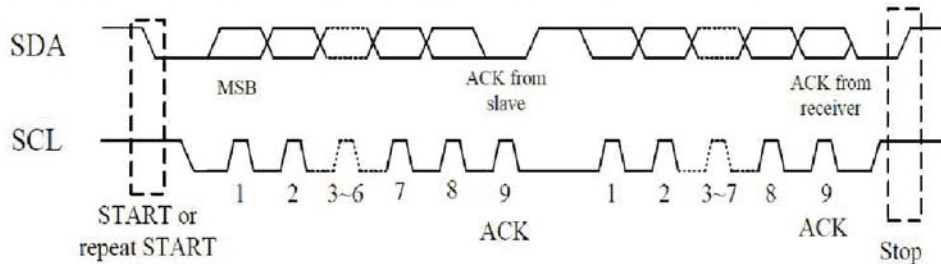


Figure I2C Serial Data Transfer Format

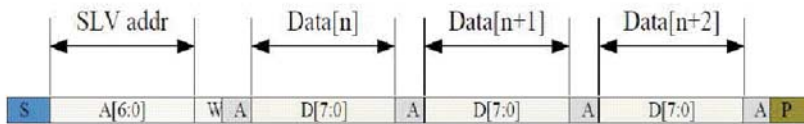


Figure I2C master write, slave read

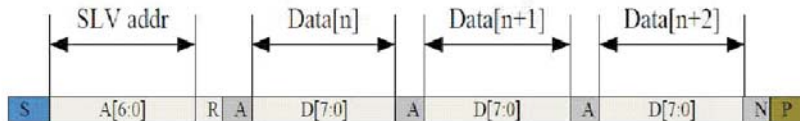


Figure I2C master read, slave write

Table lists the meanings of the mnemonics used in the above figures.

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**Table Mnemonics Description**

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address
R/ W	READ/WRITE bit, '1' for read, '0' for write
A(N)	ACK(NACK) bit
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

I2C Interface Timing Characteristics is shown in Table

**Table I2C Timing Characteristics**

Parameter	Min	Max	Unit
SCL frequency	10	400	KHz
Bus free time between a STOP and START condition	4.7	\	us
Hold time (repeated) START condition	4.0	\	us
Data setup time	250	\	ns
Setup time for a repeated START condition	4.7	\	us
Setup Time for STOP condition	4.0	\	us



## PRODUCT SPECIFICATIONS

VDDA=2.8~3.3V, Ta=-10~60°C

Item	Min	Typ	Max	Unit	Note
Transmittance	86	87		%	
Power Supply voltage	2.8		3.6	V	DC
Power Supply Current(Active Mode)		7.5	10	mA	
Power Supply Current(monitor Mode)		3.7		mA	
Input high-level voltage	0.8 x VDDA		VDDA	V	
Input low-level voltage	-0.3		0.2 x VDDA	V	
Output high-level voltage	0.8 x VDDA			V	IOH=-0.1mA
Output low-level voltage			0.2 x VDDA	V	IOH=0.1mA

Note: All current measurements are average current.

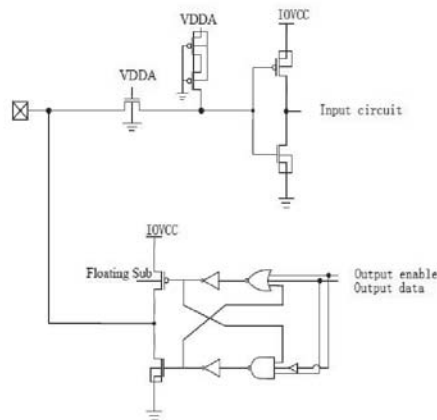


Figure General Purpose In/Out Port Circuit.

The input/output property can be configured via firmware setting. The firmware can also control its output behavior as push-pull or as open-drain that SDA of I2C interface is required.

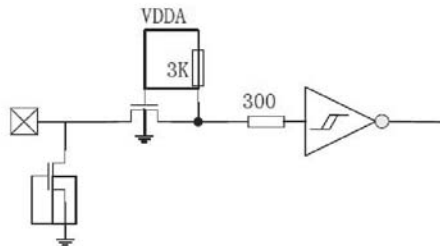


Figure Reset Input Port Circuits

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**POWER ON/Reset Sequence**

Reset should be pulled down to be low before powering on and powering down. I2C shouldn't be used by other devices during Reset time after VDD powering on ( $T_{rtp}$ ). INT signal will be sent to the host after initializing all parameters and then start to report points to the host. If Power is down, the voltage of supply must be below 0.3V and  $T_{pdt}$  is more than 1ms.

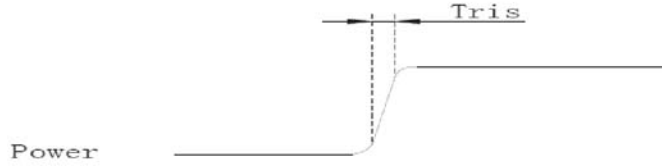


Figure Power on time

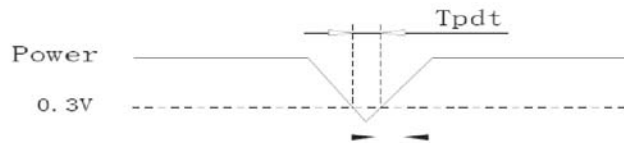


Figure Power Cycle requirement

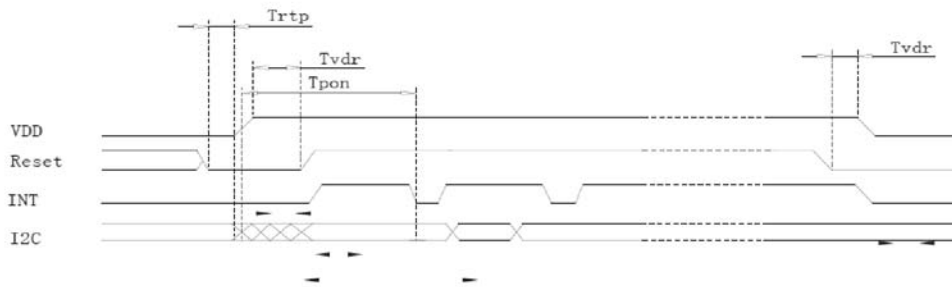


Figure Power on Sequence

Reset time must be enough to guarantee reliable reset, the time of starting to report point after resetting approach to the time of starting to report point after powering on.

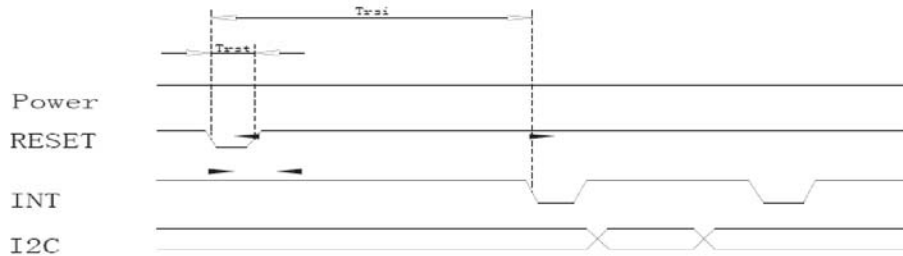


Figure Reset Sequence

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**Table Power on/Reset Sequence Parameters**

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Tpdt	Time of the voltage of supply being below 0.3V	5	--	ms
Trtp	Time of resetting to be low before powering on	100	--	$\mu$ S
Tpon	Time of starting to report point after powering on	200	--	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Trsi	Time of starting to report point after resetting	200	--	ms
Trst	Reset time	1	--	ms

## FPC INTERFACE PIN

### ● Connector Type

Connecting Type	Pins Number	Manufacturer	Part Number
ZIF	6	HRS FH 19C	

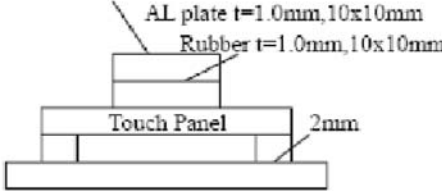
### ● Pin Definitions

NO.	Pin Name	Description
1	VCC	Digital ground
2	SCL	I2C SDA
3	SDA	Analog power supply
4	RESET	Reset Signal
5	INT	I2C SCL
6	GND	External interrupt to the host

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## RELIABILITY TEST

### ● Mechanical Test

No.	Item	Requirement	Verification method
1	Firm character	No flaw	64G steel-ball fall from 55CM height
2	Static Load Resistance Test	No crack after test	<p>After 4.5Kg load for 1 min is applied to the center area(1.0cm<sup>2</sup>)of the touch panel, the requirements in optical characteristic and electrical characteristics shall be satisfied</p> 
3	Surface hardness	6H	

### ● Electrical Test

No.	Item	Specification	Remark
1	Function test	No OPEN and no SHORT for all sensors. Linearity is OK	Test Condition: Temperature: 25°C Voltage: 3.3V

### ● Optical Test

No.	Item	Specification	Remark
1	Transmission	T87%	Total light wavelength

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