CONFIDENTIAL(B)

SPECIFICATION

OF

LIQUID CRYSTAL DISPLAY MODULE

UNITED RADIANT TECHNOLOGY CORP. 光聯科技 Feb-04-2025 品管部 QC DEPT.

CUSTOMER : URT-STD

Model No. : UMOH-9153MD-2T

Model version : 0

Document Revision : 1

CUSTOMER APPROVED SIGNATURE			

This specification need to be signed by purchaser or customer as a specification of products production and delivery from URT. Without signature of this specification , any purchase order for this model no. will be treated and considered that this specification is automatically acknowledged and accepted by purchaser or customer.

U.R.T. UNITED RADIANT TECHNOLOGY CORPORATION

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Revision record

Document Revision	Model No. Version No.	Description	Revision by
0	UMSH-9153MD-2T Version No. 0	4.3” TFT LCD.	Peggy Ho Y.C.Lin 10-Apr-2018
1	UMOH-9153MD-2T Version No. 0	1. Change LCD and Driver IC. 2. Modify the module number for UMSH-9153MD-2T to UMOH-9153MD-2T.	Micky Ko Eric Wang 04-Feb-2025

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1. BASIC SPECIFICATION

1.1 Mechanical specifications

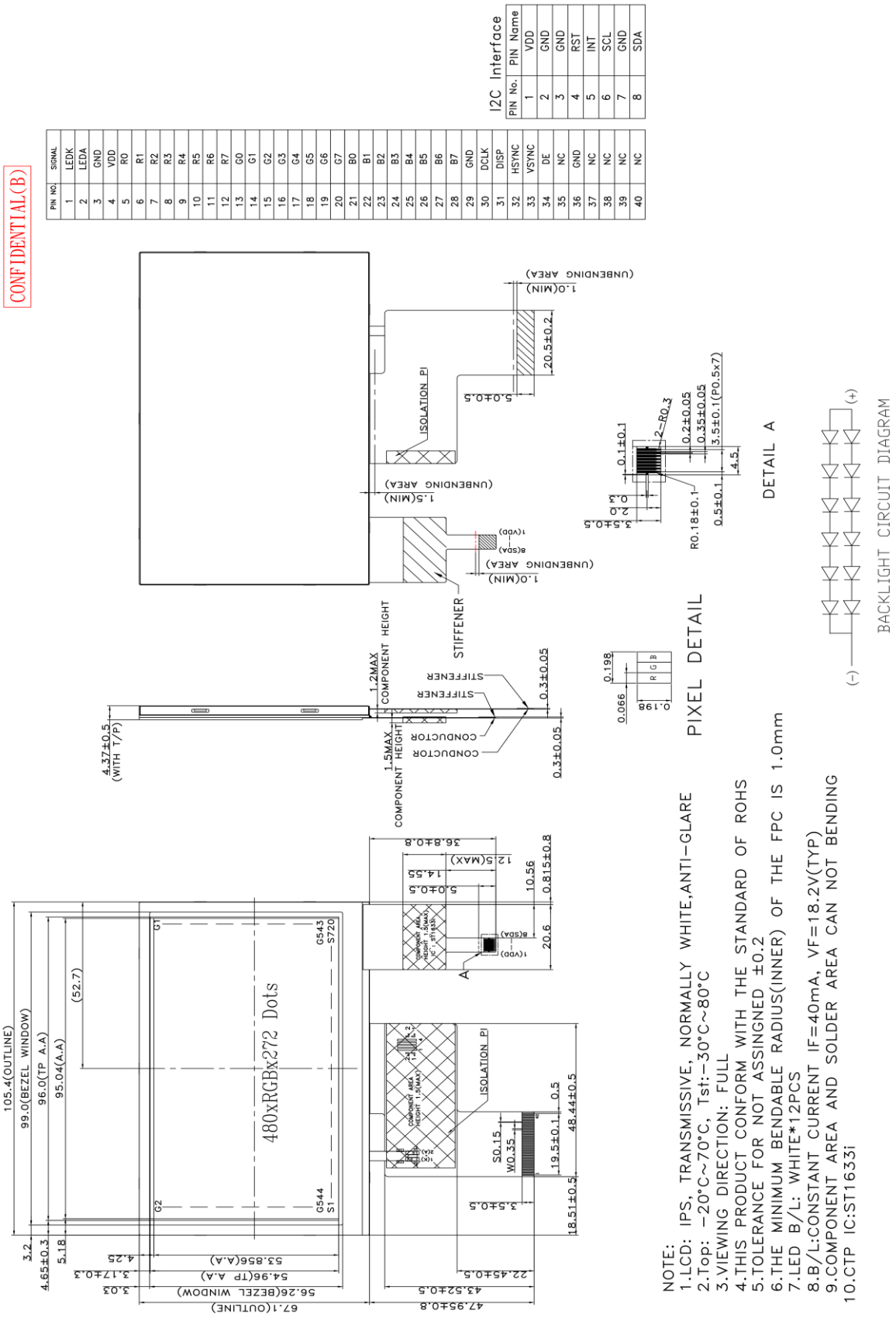
Items	Nominal Dimension	Unit
Active screen size	4.3” diagonal	-
Dot Matrix	480 x RGB x 272	Pixel
Module Size (W x H x T)	105.4 x 67.1 x 4.37	mm.
Active Area (W x H)	95.04 x 53.856	mm.
Pixel Size (W×H)	0.198 x 0.198	mm.
Color depth	16.7M	color
Interface	Parallel 24-bit RGB	-
Driving IC Package	COG	-
Module weight	TBD±10%	g

1.2 Display specification

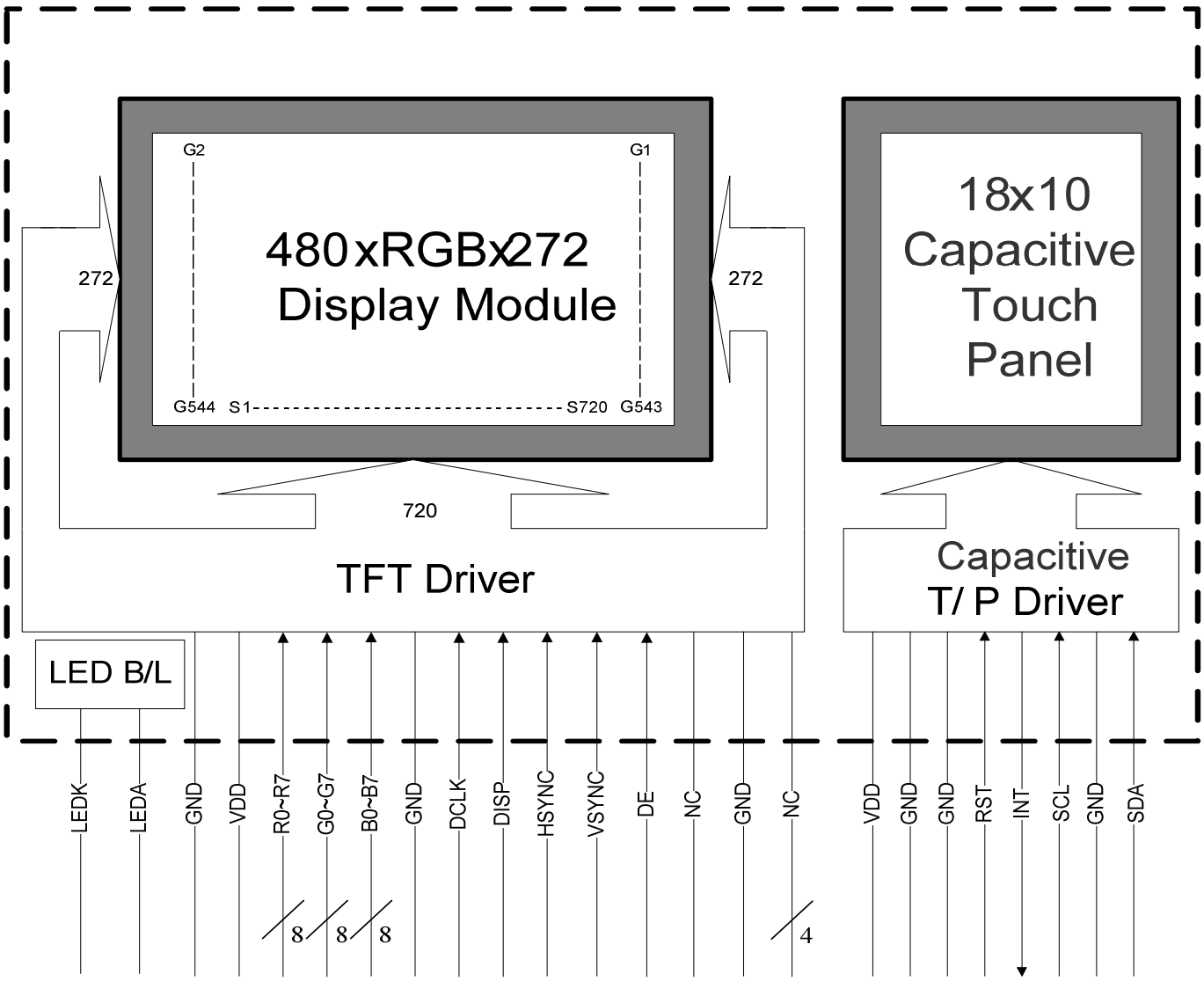
Display	Descriptions	Note
LCD Type	a-Si TFT	-
LCD Mode	Normally Black	-
Polarizer Mode	Transmissive	-
Polarizer Surface	ANTI-GLARE	-
Pixel arrangement	RGB-stripe	-
Backlight Type	LED	-
Viewing Direction(Gray inversion)	Free	-

*Color tone is slightly changed by temperature and driving voltage.

1.3 Outline dimension



1.4 Block diagram:



1.5 Interface Pin Connection :

Pin No.	Pin Symbol	I/O	Description
1	LEDK	P	Power for LED backlight cathode.
2	LEDA	P	Power for LED backlight anode.
3	GND	P	Power Ground.
4	VDD	P	Power Voltage.
5 ~ 12	R0 ~ R7	I	Red data signal.
13 ~ 20	G0 ~ G7	I	Green data signal.
21 ~ 28	B0 ~ B7	I	Blue data signal.
29	GND	P	Power Ground.
30	DCLK	I	Dot data clock.
31	DISP	I	Display on/off.
32	HSYNC	I	Horizontal sync signal.
33	VSYNC	I	Vertical sync signal.
34	DE	I	Data Enable.
35	NC	-	No connect.
36	GND	P	Power Ground.
37~40	NC	-	No connect.

Capacitive touch panel pin:

Pin No.	Pin Symbol	I/O	Description
1	VDD	P	Power supply. (+3.3V)
2	GND	P	Ground for logic. (0V)
3	GND	P	Ground for logic. (0V)
4	RST	I	System reset signal input, active low and needs hold low for 5ms to take effect.
5	INT	O	Active low when data output from touch panel.
6	SCL	I	Serial clock.
7	GND	P	Ground for logic. (0V)
8	SDA	I/O	Serial data access.

Note : SDA / SCL pins must connected to 4.7Kohm(Pull-up resistor) at host.

2. ELECTRICAL CHARACTERISTICS

2.1 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit
Power supply voltage	VDD	-0.3	4.0	V
Operate temperature range	TOP	-20	70	℃
Storage temperature range	TST	-30	80	℃

*Note1 :

The operating temperature is for product's functionality, please pay attention to human injury when using the product under extreme temperature.

2.2 DC Characteristics

T_a= 25℃

Items	Symbol	Min.	Typ.	Max.	Unit	Condition
Supply voltage	VDD	3.0	3.3	3.6	V	-
Input Voltage	V_{IL}	0	-	0.3VDD	V	L level
	V_{IH}	0.7VDD	-	VDD	V	H level
Current consumption	I_{VDD}	-	-	40	mA	Note 1
	$I_{VDD(CTP)}$	-	15	30	mA	

*Note1 :
Measuring Condition:
Standard Value MAX.
Ta = 25°C
VDD -GND = 3.3V
Display Pattern

2.3 Back-light only Specification :

PARAMETER	SYMBOL	MIN	TYP	MAX	Unit	Test Condition	NOTE
Supply Current	If	-	40	-	mA	Ta=25°C	-
Supply Voltage	Vf	-	18.2	-	V	Ta=25°C	-
Half-Life Time	Lf	-	50000	-	hrs	Ta=25°C	1

Note 1：The "Half-Life Time" is defined as the LED chip brightness decreases to 50% than original brightness, Based on Ta 25±2°C,60±10% RH condition.

2.4 AC Characteristics

Parallel RGB Input Timing Requirement

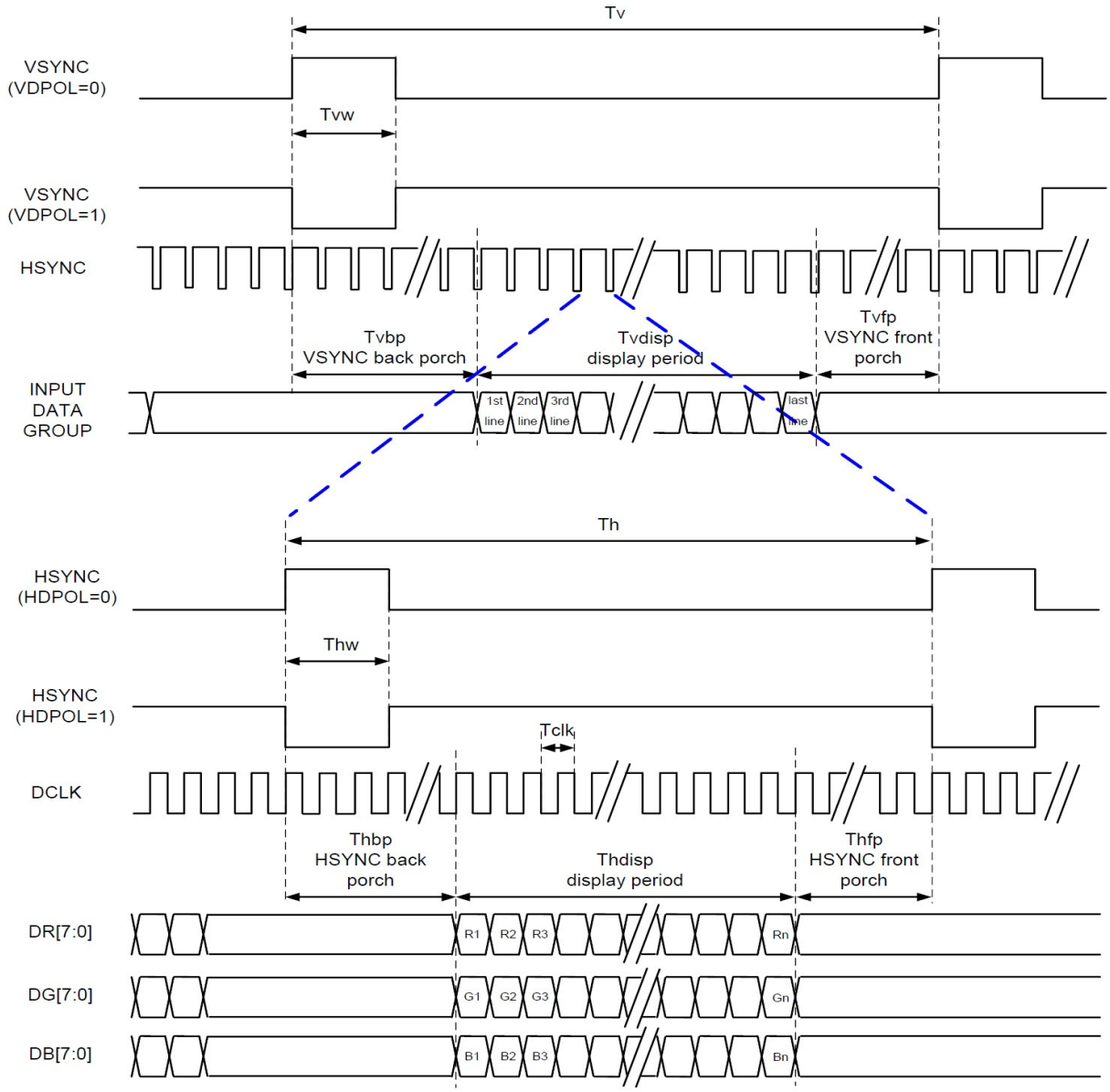
Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

480RGB X 272 Resolution Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	83	111	125	ns	
HSYNC	Period Time	Th	485	531	598	DCLK	
	Display Period	Thdisp	-	480	-	DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	75	DCLK	
VSYNC	Period Time	Tv	276	292	321	HSYNC	
	Display Period	Tvdisp	-	272	-	HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	37	HSYNC	

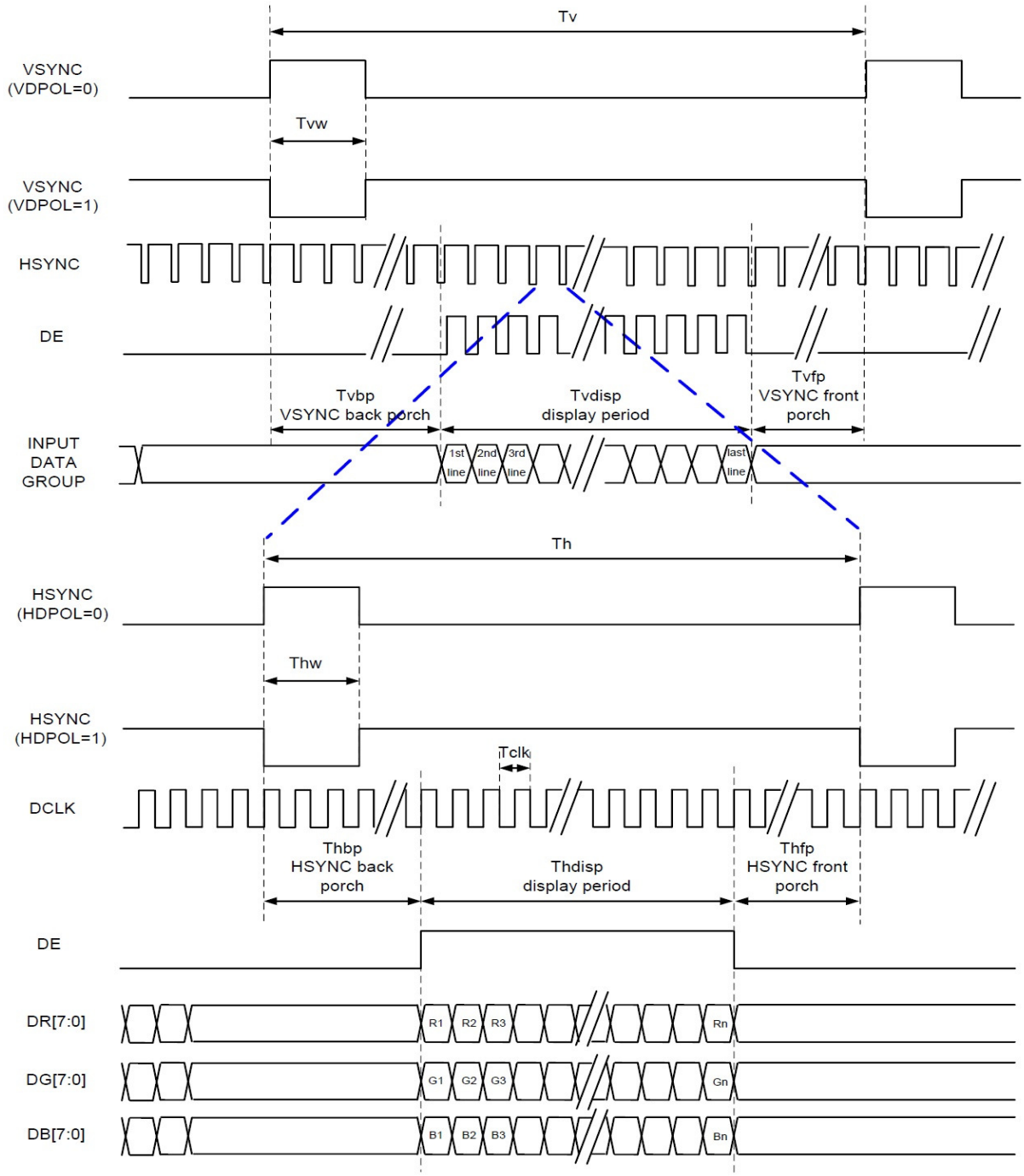
Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

Interface Timing Chart

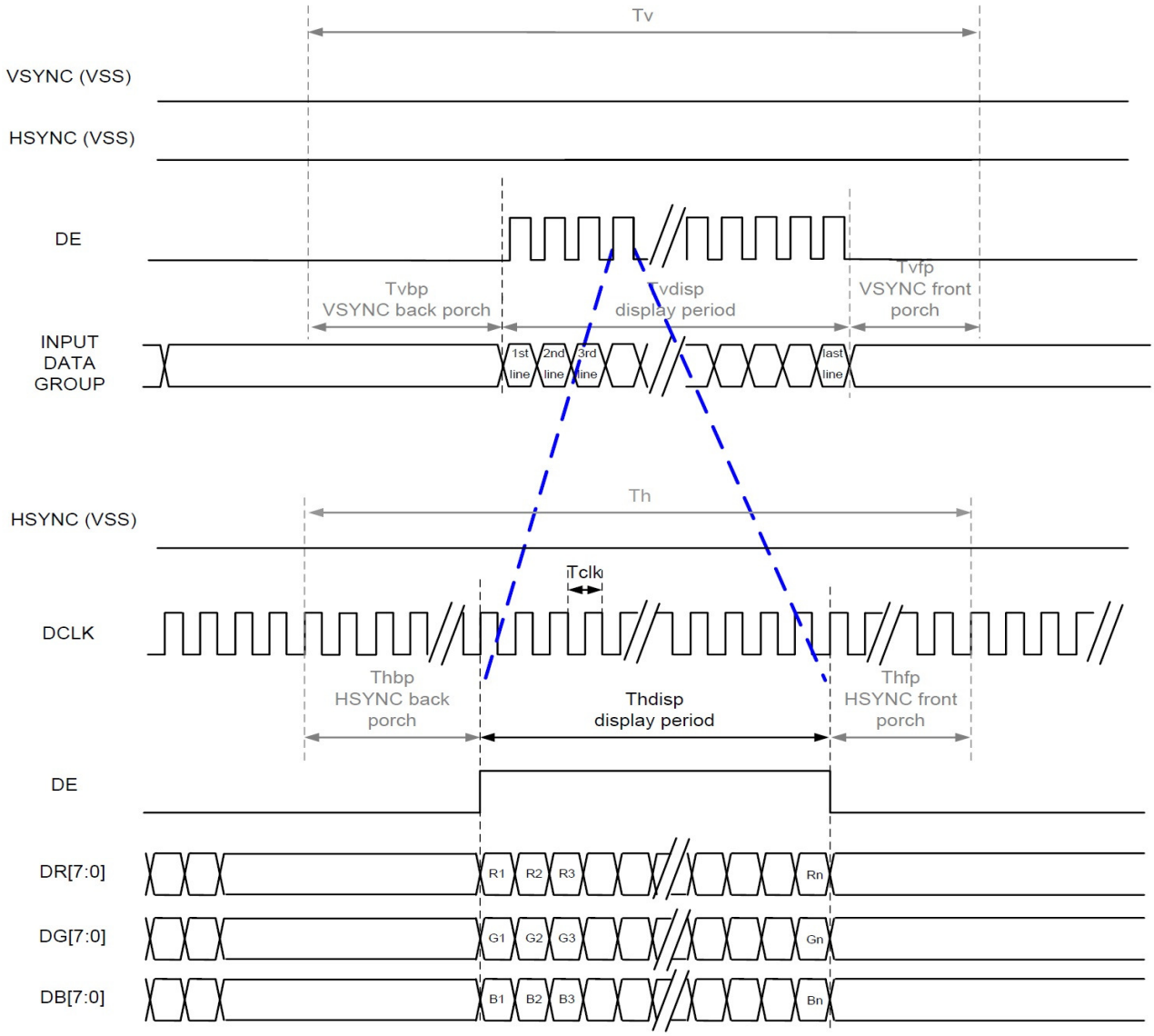
RGB Interface
SYNC Mode



SYNC-DE Mode


Tv
VSYNC (VDPOL=0)
Tvw
VSYNC (VDPOL=1)
HSYNC
DE
Tvbp VSYNC back porch
Tvdisp display period
Tvfp VSYNC front porch
INPUT DATA GROUP
1st line
2nd line
3rd line
last line
Th
HSYNC (HDPOL=0)
Thw
HSYNC (HDPOL=1)
Tclk
DCLK
Thbp HSYNC back porch
Thdisp display period
Thfp HSYNC front porch
DE
DR[7:0]
R1
R2
R3
Rn
DG[7:0]
G1
G2
G3
Gn
DB[7:0]
B1
B2
B3
Bn

DE Mode

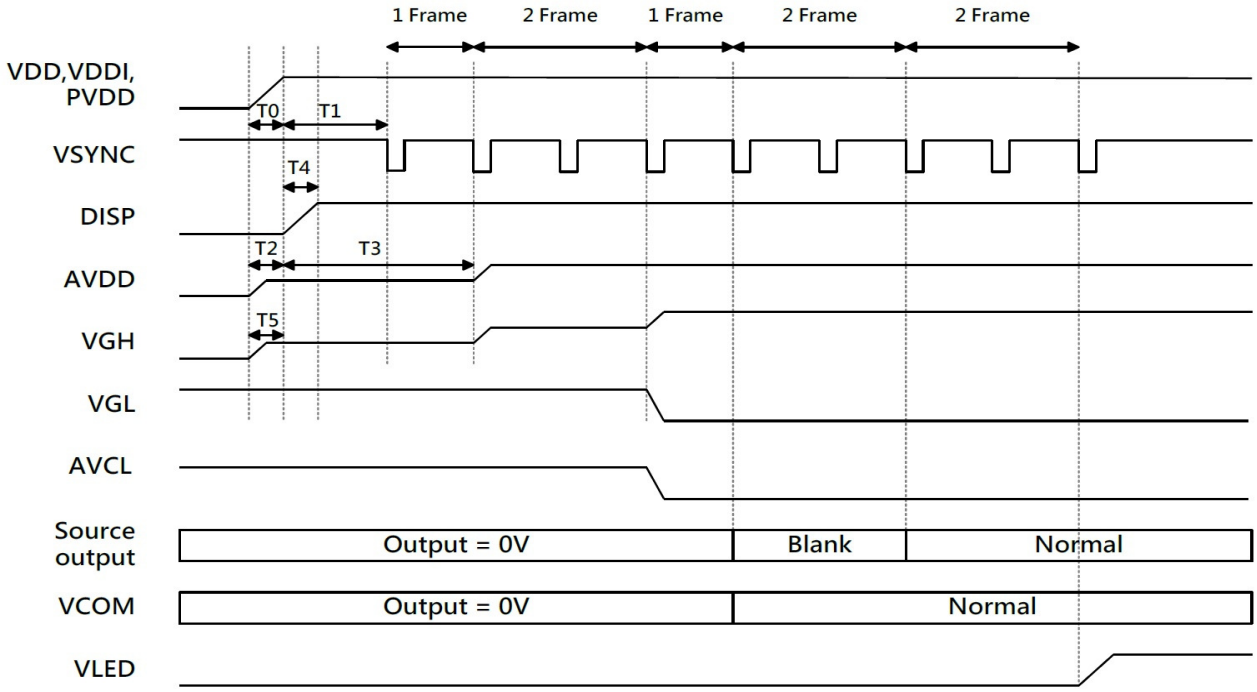


RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: "Input" means these signals are driven by host side.

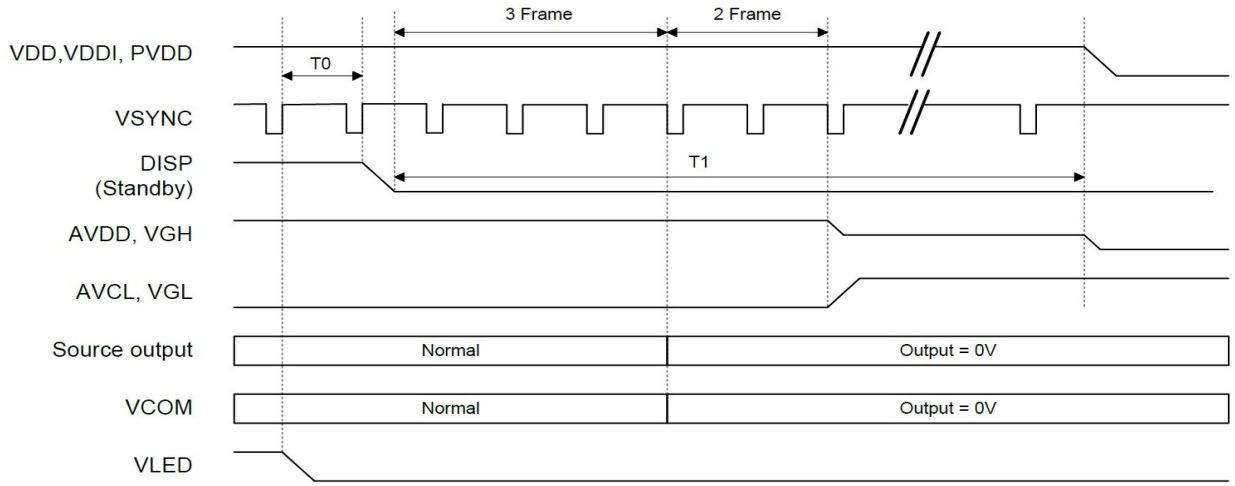
2.5 Power Sequence Timing

Power On Sequence



	Description	Min. Time
T0	Determined by the external power	
T1	Time from stable VDD, VDDI, PVDD set-up to the first VSYNC	T1=0
T2	Time from AVDD=0V to AVDD=3.3V	T2=T0
T3	Time from AVDD=3.3V to AVDD=6.0V	T3=T1+ (1*Frame)
T4	Time from stable VDD, VDDI, PVDD set-up to DISP asserted	T4=0
T5	Time from VGH=0V to VGH=3.3V	T5=T0

Power Off Sequence



Item	Description	Min. Time
T0	Time from backlight power off to DISP="L"	1*Frame
T1	Time from DISP="L" to LCM Power off	5*Frame

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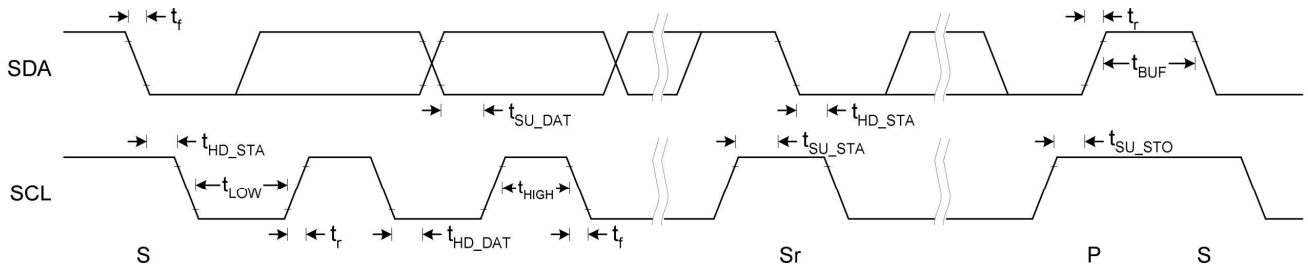


I2C Fast Mode Timing

I2C Fast Mode Timing Characteristic

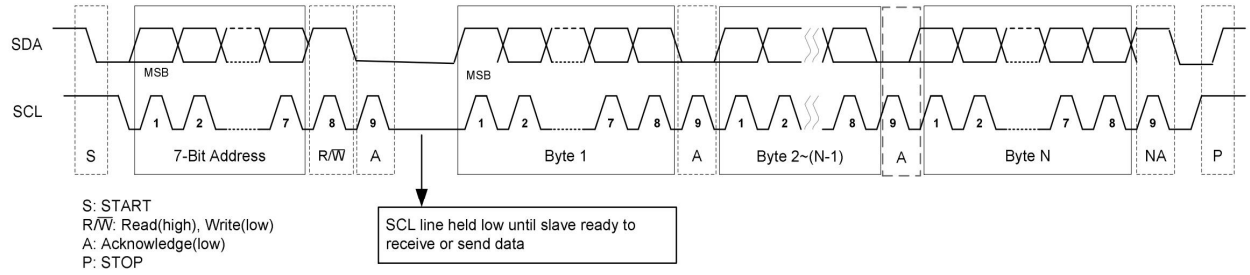
Conditions: VDD = 3.3V, GND = 0V, T_A = 25°C

Symbol	Parameter	Rating			Unit
		Min.	Typ.	Max.	
f_{SCL}	SCL clock frequency	0	-	400	kHz
t_{LOW}	Low period of the SCL clock	1.3	-	-	us
t_{HIGH}	High period of the SCL clock	0.6	-	-	us
t_f	Signal falling time	-	-	300	ns
t_r	Signal rising time	-	-	300	ns
t_{SU_STA}	Set up time for a repeated START condition	0.6	-	-	us
t_{HD_STA}	Hold time (repeated) START condition. After this period, the first clock pulse is generated	0.6	-	-	us
t_{SU_DAT}	Data set up time	100	-	-	ns
t_{HD_DAT}	Data hold time	0	-	0.9	us
t_{SU_STO}	Set up time for STOP condition	0.6	-	-	us
t_{BUF}	Bus free time between a STOP and START condition	1.3	-	-	us
C_b	Capacitive load for each bus line	-	-	400	pF

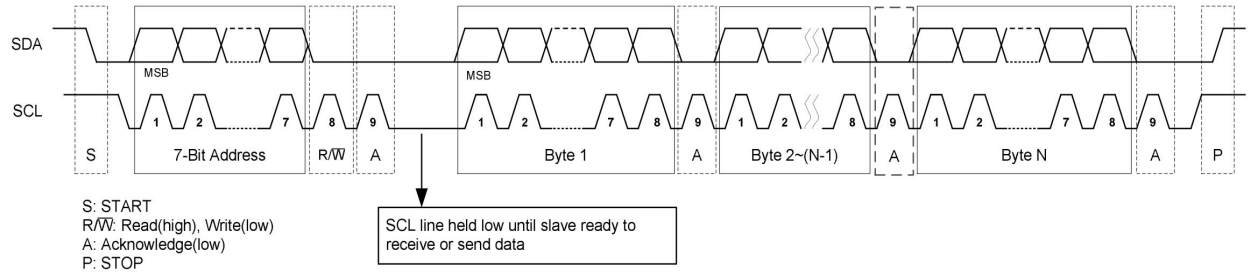
Touch Panel I2C Host Interface Protocol:

I2C Slave Interface

Read



Write



I2C Waveform

Note : I2C address is default to 0x55 (7-bits address)

Touch Panel Register Read

For reading register value from I2C device, host has to tell I2C device the *Start Register Address* before reading corresponding register value.

I2C Start	I2C Header (W)	Start Reg. Addr. (a)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop

Figure 1 - Register Read Format.

Sitronix Touch IC I2C host interface protocol supports *Repeated Register Read*. That is, once the *Start Register Address* has been set by host, consequent I2C Read(R) transactions will directly read register values starting from the *Start Register Address* without setting address first, as shown in Figure 2.

I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop	I2C Start	I2C Header (R)	Value of Reg(a)	Value of Reg(a+1)	…	Value of Reg(a+n)	I2C Stop

Figure 2 - Repeated Register Read.

Header Value(R) : 0xab

Touch Panel Register Write

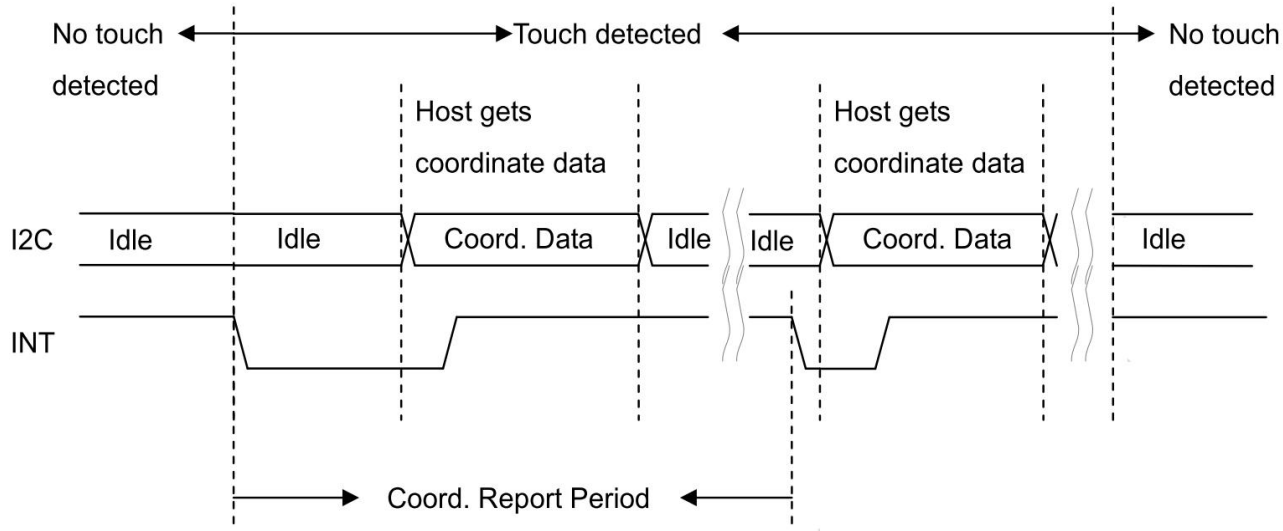
For writing register to I2C device, host has to tell I2C device the Start Register Address in each I2C Register Write transaction. Register values to the I2C device will be written to the address starting from the Start Register Address described in Register Write I2C transaction as shown in Figure 3.

I2C Start	I2C Header (W)	Start Reg. Addr. (a)	Value to Reg(a)	Value to Reg(a+1)	…	Value to Reg(a+n)	I2C Stop

Figure 3 - Register Write Format.

Header Value(W) : 0xaa

Touch Panel I2C Electrical Waveform



Touch Panel Registers

Sitronix Touch IC provides a register set for host to configure device attributes and retrieve information about Device Control , XY Coordinates through device host interface. Host interface registers are listed below.

Host Interface Registers (Report Page)									
Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x00	Firmware Version	Version (RO)							
0x01	Status Reg.	Error Code (RO)				Device Status (RO)			
0x02	Device Control Reg.	Reserved				Reserved	Reserved	Power Down (R/W)	Reset (R/W)
0x03	Timeout to Idle Register	Timeout to Idle (Sec) (R/W)							
0x04	XY Resolution (High Byte)	Reserved	X_Res_H (RO)			Reserved	Y_Res_H (RO)		
0x05	X Resolution (High Byte)	X_Res_L (RO)							
0x06	Y Resolution (High Byte)	Y_Res_L (RO)							
0x07 ~ 0x11	------	Reserved							
0x12	XY0 Coord. (High Byte)	Valid 0 (RO)	X0_H(RO)			Reserved	Y0_H (RO)		
0x13	X0 Coord. (Low Byte)	X0_L(RO)							
0x14	Y0 Coord. (Low Byte)	Y0_L(RO)							
0x15		Reserved							
0x16	XY1 Coord. (High Byte)	Valid 1 (RO)	X1_H(RO)			Reserved	Y1_H (RO)		
0x17	X1 Coord. (Low Byte)	X1_L(RO)							
0x18	Y1 Coord. (Low Byte)	Y1_L(RO)							
0x19		Reserved							
0x1A	XY2 Coord. (High Byte)	Valid 2 (RO)	X2_H(RO)			Reserved	Y2_H (RO)		
0x1B	X2 Coord. (Low Byte)	X2_L(RO)							
0x1C	Y2 Coord. (Low Byte)	Y2_L(RO)							
0x1D		Reserved							
0x1E	XY3 Coord. (High Byte)	Valid 3 (RO)	X3_H(RO)			Reserved	Y3_H (RO)		
0x1F	X3 Coord. (Low Byte)	X3_L(RO)							
0x20	Y3 Coord. (Low Byte)	Y3_L(RO)							
0x21		Reserved							
0x22	XY4 Coord. (High Byte)	Valid 4 (RO)	X4_H(RO)			Reserved	Y4_H (RO)		
0x23	X4 Coord. (Low Byte)	X4_L(RO)							
0x24	Y4 Coord. (Low Byte)	Y4_L(RO)							

Firmware Version Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x00	Firmware Version	Version (RO)							

Firmware Version Register provides version information about current firmware. Host application can support version control in firmware upgrade function by reading Firmware Version Register and comparing with the version of new firmware binary.

Status Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x01	Status Reg.	Error Code (RO)				Device Status (RO)			

Status Register shows current status of the device to host, including Device Status and Error Code. Init status represents that the device is in Init state and not ready for host access. Host has to wait for the device to change into Normal state before accessing registers other than Status Register. If Device Status shows Error, the Error Code field in the Status Register gives reason of the error.

Device Status	
0x0	Normal
0x1	Init
0x2	Error
0x3	Auto Tuning
0x4	Idle
0x5	Power Down
0x6	Boot ROM
0x7	Waiting to execute Sub-AP
0x8 ... 0xF	Reserved

Error Code	
0x0	No Error
0x1	Invalid Address
0x2	Invalid Value
0x3	Invalid Platform
0x4	Dev Not Found
0x5	Stack Overflow
0x6	Invalid Firmware Parameter Table
0x7	Invalid Secondary Touch Firmware
0x8 ... 0xF	Reserved

Device Control Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x02	Device Control Reg.	Reserved				Reserved	Reserved	Power Down (R/W)	Reset (R/W)

Device Control Register provides device control bits for host to reset the device , power down the device.

When host sets Power Down bit, touch sensor controller will enter power down mode. Host can clear Power Down bit tc wake up the controller.

Timeout to Idle Register

Reg Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x03	Timeout to Idle Register	Timeout to Idle (Sec) (R/W)							

Timeout to Idle Register provides timeout control to entering Idle Mode for host.

The touch controller will enter Idle Mode after the number of seconds specified in Timeout to Idle Register if there is no touch detected in this period.

Set the field to 0xFF will disable Idle Mode. Set the field to 0 will entering Idle Mode immediately.

The default value of Timeout to Idle Register is set to 0x08 for 8 seconds to Idle Mode.

XY Resolution Registers

Reg Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x04	XY Resolution (High Byte)	Reserved	X_Res_H (RO)			Reserved	Y_Res_H (RO)		
0x05	X Resolution (High Byte)	X_Res_L (RO)							
0x06	Y Resolution (High Byte)	Y_Res_L (RO)							

XY Resolution Registers represents resolution of X and Y coordinates of the touch screen.

XY Coordinate Registers

0x12	XY0 Coord (High Byte)	Valid 0 (RO)	X0_H(RO)	Reserved	Y0_H (RO)
0x13	X0 Coord (Low Byte)	X0_L(RO)			
0x14	Y0 Coord (Low Byte)	Y0_L(RO)			
0x15		Reserved			
0x16 ~ 0x21	…	…			
0x22	XY4 Coord (High Byte)	Valid 4 (RO)	X4_H(RO)	Reserved	Y4_H (RO)
0x23	X4 Coord (Low Byte)	X4_L(RO)			
0x24	Y4 Coord (Low Byte)	Y4_L(RO)			

XY Coordinate Registers represent the XY coordinates for each touch point ID.

Valid bit field tells that this point ID is valid and the XY information represents a real touch point on touch sensor.

3. OPTICAL CHARACTERISTICS

3.1 Characteristics

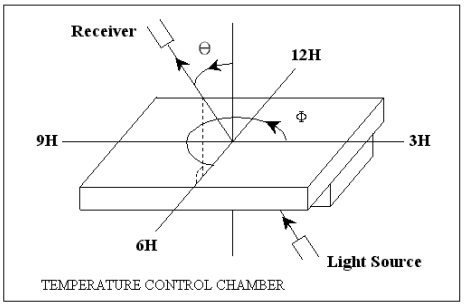
Electrical and Optical Characteristics

No.	Item			symbol / temp.		Min.	Typ.	Max.	Unit	Note
1	Response Time			Tr+Tf	25 ℃	-	30	35	ms	2
2	Viewing Angle	Hor.	Cr≧10	θ_{2+}	Φ = 0°	70	80	-	degree	3
				θ_{2-}	Φ = 180°	70	80	-		
		Ver.		θ_{1+}	Φ = 270°	70	80	-		
				θ_{1-}	Φ = 90°	70	80	-		
3	Contrast Ratio			Cr	25 ℃	-	TBD	-	-	4
4	Red x-code			Rx	25 ℃	-	TBD	-	-	5
	Red y-code			Ry		-	TBD	-		
	Green x-code			Gx		-	TBD	-		
	Green y-code			Gy		-	TBD	-		
	Blue x-code			Bx		-	TBD	-		
	Blue y-code			By		-	TBD	-		
	White x-code			Wx		-	TBD	-		
	White y-code			Wy		-	TBD	-		
	Brightness			Y		-	TBD	-	cd/m^2	
5	Brightness Uniformity				25 ℃	-	TBD	-	%	6

3.2 Definition of optical characteristics

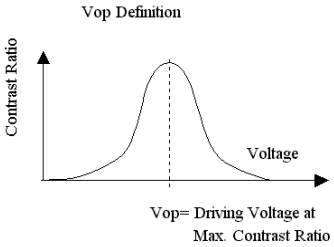
Measurement condition :

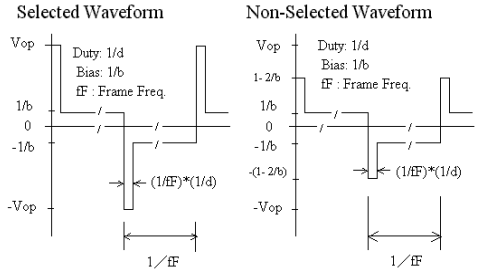
Transmissive and Transflective type



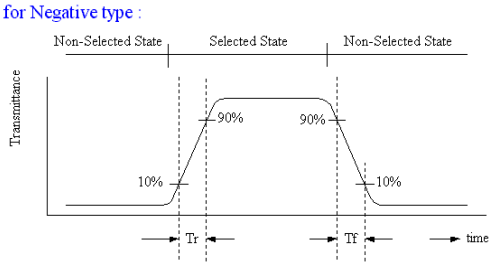
PHOTAL LCD-5000

[Note 1] Definition of LCD Driving Vop and Waveform :

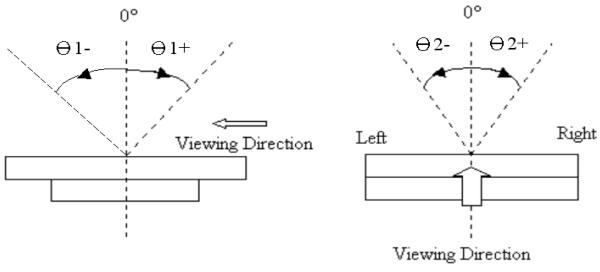




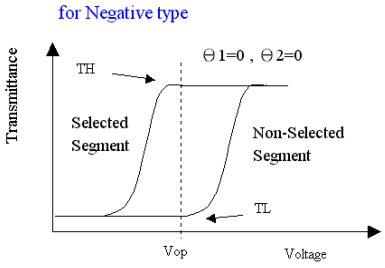
[Note 2] Definition of Response Time



[Note 3] Definition of Viewing Angle :

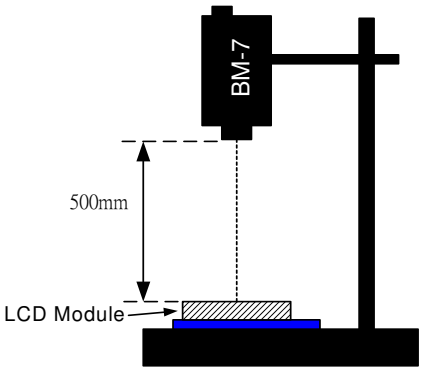


[Note 4] Definition of Contrast Ratio :

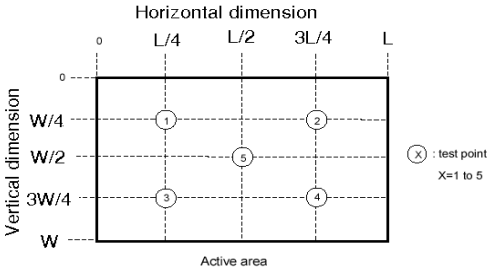


$$\text{Contrast Ratio} = \frac{TH}{TL}$$

[Note 5] Definition of measurement of Color Chromaticity and Brightness



[Note 6] Definition of Brightness Uniformity



$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point 1~5}}{\text{Maximum Brightness of Point 1~5}}$$

4. RELIABILITY :

Item No	Items	Condition	Note
1	High temperature operating	70 ℃ , 200 hours	IEC60068-2-2 Note 1
2	Low temperature operating	-20 ℃ , 200 hours	IEC60068-2-1 Note 1
3	High temperature storage	80 ℃ , 200 hours	IEC60068-2-2 Note 1
4	Low temperature storage	-30 ℃ , 200 hours	IEC60068-2-1 Note 1
5	High temperature & humidity storage	60℃, 90%RH, 100 hours	IEC60068-2-78 Note 2
6	Thermal Shock storage	-30℃, 30min.<=> 80℃, 30min. 10 Cycles	IEC60068-2-14 Note 1
7	Vibration test	10 => 55 =>10 => 55 => 10 Hz , within 1 minute Amplitude : 1.5mm. 15 minutes for each Direction (X,Y,Z)	IEC60068-2-6
8	Drop test	>10Kg : 60 cm ; ≤10Kg : 80 cm 6 sides, 1 corner, 3edges, Free fall.	IEC60068-2-32

Note 1：The product move into the room temperature for at least 2 hours with no condensation.

Note 2：The product move into the room temperature for at least 24 hours with no condensation.

Note 3 : Please change the display picture (autorun) during operating mode. Avoid displaying static images

* One single product test for only one item.
* One single product test for only one item.
* Judgment after test : keep in room temperature for more than 2 hours.
  - Current consumption < 2 times of initial value
  - Function : work normally

5. PRODUCT HANDLING AND APPLICATION

5.1 PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection eguipement to prevent ESD hurt on products.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the LCM protective film slowly since static electricity may be generated.
- Hand Soldering : Soldering temperature less than 260℃,within 5 sec, at 5 mm. Away from pin connection.
- Do not touch the display surface or connection terminals area with bare hands.Smudges on the display surface reduce the insulation between terminals.
- Do not twist or bend the modules and also avoid any inappropriate external force on display surface during assembly.
- Do not expose LCM to organic solvent. IF clean the surface , wipe it gently with soft cloth dampened by alcohol.
- Do not attempt to wiped off the contact pads.
- Keep LCM panels away from direct sunlight or fluorescent light, , also avoid them in high-temperature & high humidity environment for a long period.
- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- Do not drive LCM by DC voltage & avoid displaying at certain pattern for a long time otherwise it might cause image sticking.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Never use the LCD , LCM under 45 Hz , the liquid crystal will decomposition and cause permently damage on display !!
- Liquid in LCM is hazardous substance. In case a contact with liquid crystal material is occured, be sure to immediately wash such material away by soap and water.
- The polarizer is easily damaged and should be handle with special care. Don't press or rub it with hard objects.

5.2 PRECAUTION FOR STORING

- Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
- Do not store the module in surroundings containing organic solvent or corrosive gas
- Store the module in an anti-electrostatic container or bag.

5.3 USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

- For the application in medical care, safety and hazardous prodcuts or systems, an authorization from URT is required. URT will not responsible for any damage or loss which caused by the products without any authorization given by URT.
- This product is not allowed to be designed and used for military application and/or purpose.
- The delivery of this product to the countries and/or regions where the embargoes are imposed by U.N. is prohibited.
- The application and delivery of this product must comply with Startegic High-Tech Commodities (SHTC) export control and the sales to the embargoed and/or sanctioned countries or regions are strictly prohibited.

6. DATE CODE OF PRODUCTS

- Date code will be shown on each product :

- **YY MM DD - XXXX**

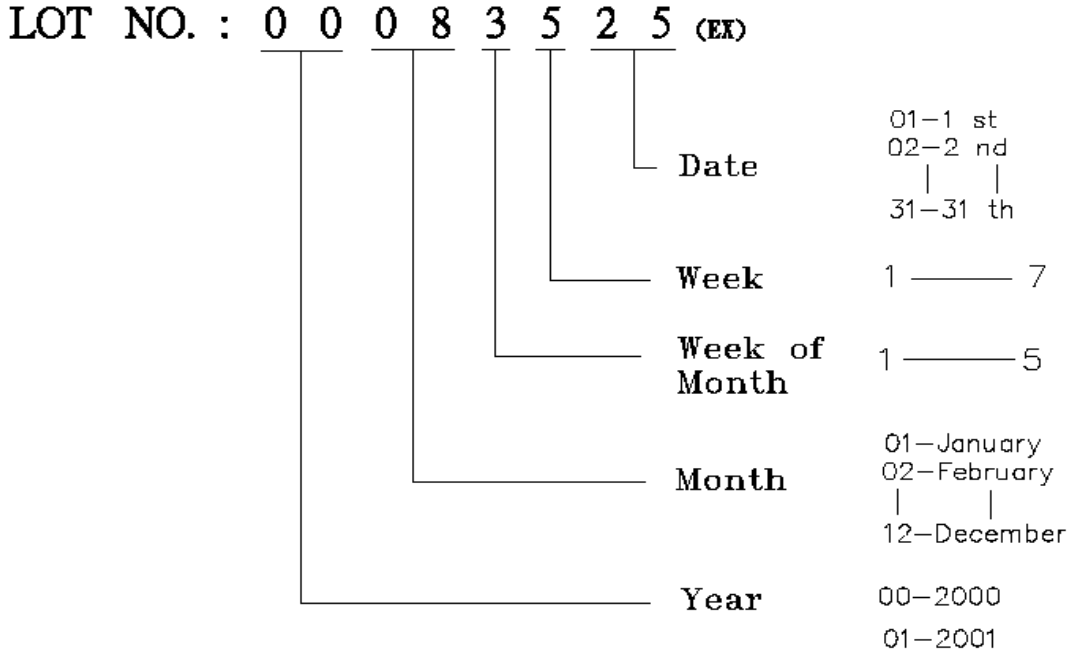
  Year Month Day - Production control number

- Example: 241108 - 0003 ==> Year 2024, November,8th ,
  Production control number no. 0003

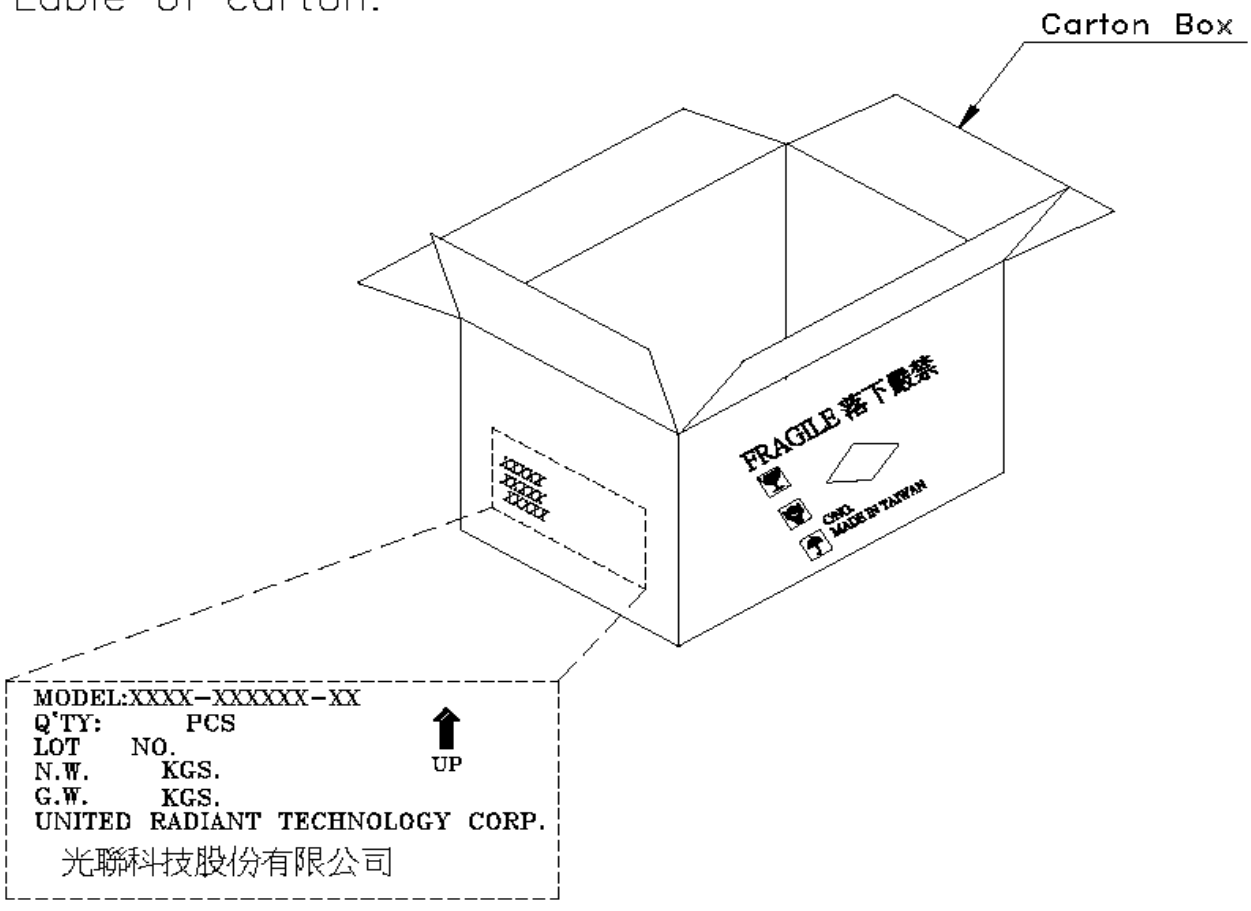
Note ： The lot no. attached on the packing box will be used for tracking once the part is too small to print the date code.

7.LOT NO.

Instruction of lot number:



Lable of carton:



8. Inspection Standard

8.1 Quality :

The quality of goods supplied to purchaser shall come up to the following standard.

8.1.1 The Method Of Preserving Goods

After delivery of goods fromU.R.T. to purchaser. Purchaser shall control the LCM at -10 ℃ to 40 ℃ and it might be desirable to keep at the normal room temperature and humidity until incoming inspection or throwing into process line.

8.1.2 Incoming Insection

(A) The method of inspection

If purchaser make an incoming inspection, a sampling plan shall be applied on the condition that quality of one delivery shall be regarded as one lot.

(B) The standard of quality

ISO-2859-1 (SAME AS MIL-STD-105E) , LEVEL Ⅱ SINGLE PLAN.

Definition	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

8.1.3 Warranty Policy

(A) U.R.T. will provied one-year warranty for the products only if under specification operating conditions.
U.R.T. will replace good products for these defect products which under warranty period and belong to the responsibility of U.R.T.

(B) The warranty period starts from delivery date.

(C) Customer is responsible for proving delivery date when customer returns defective product which is out of warranty, otherwise, the warranty period will be based on date code.

8.1.4 Respect to Specifications

(A) The specification document is the standard.

(B) Samples cannot be the inspection standard. The purpose of the sample is to assist and verify compliance with the specifications, not to be used as the inspection standard.
If samples or actual products are to be used as the inspection standard, both parties should sign an additional agreement "Inspection Sample or Limited Sample".

8.2 Checking Condition

8.2.1. Viewing distance is approximately：30 ± 5 cm.

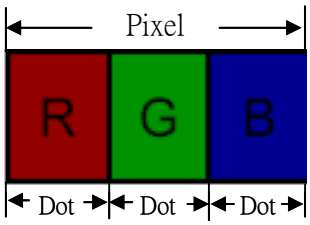
8.2.2. Viewing angle is normal to the LCD panel with 45°.

8.2.3. Ambient illuminance：2 pcs of 20W fluorescent lamps(distance to the sample >100 cm) or 1000±200 lux.

8.3. INSPECTION PLAN :

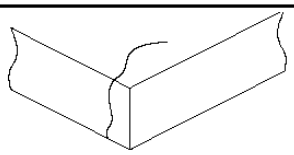
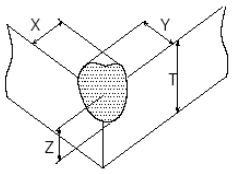
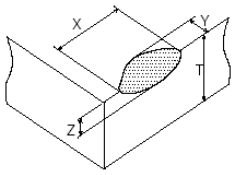
CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	(B) LINEAR TYPE: THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA ……..REJECTED	Minor
	6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST、VOP、 CHROMATICITY … ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING LINE	MISSING DOT、LINE、CHARACTER ....REJECTED	Critical
	12.SHORT CIRCUIT、 WRONG PATTERN DISPLAY	NO DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

8.4. STANDARD OF VISUAL INSPECTION

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td>8.4.1</td><td>MINOR</td><td>BLACK AND WHITE SPOT
FOREIGN MATERIEL
DUST IN THE CELL
BLEMISH
SCRATCH</td><td>(A) ROUND TYPE: unit : mm.
<table>
<tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.1</td><td>DISREGARD</td></tr>
<tr><td>0.1 < Φ ≦ 0.25</td><td>3 (Distance>5mm)</td></tr>
<tr><td>0.25 < Φ</td><td>0</td></tr>
</table>
NOTE: Φ=(LENGTH+WIDTH)/2
(B) LINEAR TYPE: unit : mm.
<table>
<tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>------</td><td>W ≦0.03</td><td>DISREGARD</td></tr>
<tr><td>L ≦ 5.0</td><td>0.03 < W ≦0.07</td><td>3 (Distance>5mm)</td></tr>
<tr><td>------</td><td>0.07 < W</td><td>FOLLOW ROUND TYPE</td></tr>
</table></td></tr>
<tr><td>8.4.2</td><td>MINOR</td><td>BUBBLE IN POLARIZER
DENT ON POLARIZER</td><td>unit : mm.
<table>
<tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦0.2</td><td>DISREGARD</td></tr>
<tr><td>0.2 < Φ ≦ 0.5</td><td>2 (Distance>5mm)</td></tr>
<tr><td>0.5 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>8.4.3</td><td>MINOR</td><td>Dot Defect</td><td>
<table>
<tr><th>Items</th><th>ACC. Q'TY</th></tr>
<tr><td>Bright dot</td><td>N≦ 4 (Distance>5mm)</td></tr>
<tr><td>Dark dot</td><td>N≦ 4 (Distance>5mm)</td></tr>
</table>
Pixel Define :
 

Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</td></tr>
</table>

8.5 INSPECTION STANDARD OF TOUCH PANEL

NO.	CLASS	ITEMS		JUDGEMENT	
8.5.1	MAJOR	Touch Panel Crack			Reject
8.5.2	MINOR	Touch Panel Chipping	Corner		Not CNC Products: X≦2mm, Y≦2mm, Z<1/2T — Accept CNC Products: For CNC Outline Dimension — Accept
			Edge		Not CNC Products: X≦3mm, Y≦3mm, Z<1/2T — Accept CNC Products: For CNC Outline Dimension — Accept
8.5.3	MINOR	Scratch Dust and Foreign Material (Linear Type)		W≦0.05, L≦10mm	Accept
				0.05mm<W≦0.07mm ; L≦5.0mm Distance between seratch>5.0mm	Accept 3 ea Max.
				W>0.07mm	Reject
8.5.4	MINOR	Scratch Dust and Foreign Material (Round Type ; Φ=(Length+Width)/2)		Φ≦0.15mm	Accept
				0.15mm<Φ≦0.25mm Distance between seratch>5.0mm	Accept 5 ea Max.
				Φ>0.25mm	Reject
8.5.5	MINOR	Touch Panel Dent / Fish Eyes (Φ=(Length+Width)/2)		Φ≦0.35mm	Accept
				0.35mm<Φ≦1.0mm Distance >5.0mm	Accept 3 ea Max.
				Φ>1.0mm	Reject
8.5.6	MINOR	Touch Panel Air Bubble (Φ=(Length+Width)/2)		Φ≦0.15mm	Accept
				0.15mm<Φ≦0.25mm Distance between bubbles>5.0mm	Accept 3 ea Max.
				Φ>0.25mm	Reject
8.5.7	MINOR	Touch Panel Printing area Scratch		W≦0.03, L≦10mm	Accept
				0.03mm<W≦0.05mm, L≦5mm	Accept 3 ea Max.
				W>0.05mm or L>5mm (W>0.05 Follow 8.5.4 Round type)	Reject
8.5.8	MINOR	Touch Panel White Haze Mark / Dust		Can not be removed	Reject