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Mechanical design

Production Custom designs Installation

Optical Bonding



SPECIFICATION FOR LCM+CTP Module

MODULE No:	ET035VG21-KT
CUSTOMER:	

YOURITECH	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



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1.Basic Specifications

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, capacitance touch panel, back-light unit. The resolution of a 3.5'TFT-LCD contains 320x480 pixels, and can display up to 16.7M colors.

1.1 TFT Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	48.96(H)X73.44(V)(3.5inch)	mm	-
CTP View Area	49.76(H)*74.24 (V)	mm	-
Driver element	TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	320(RGB)*480	dots	-
Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.051(H)*3*0.153(V)	mm	-
Viewing angle	ALL	o'clock	-
Controller IC	AXS15231	-	-
Interface	One data lane MIPI Interface		
Display mode	NORMALLY BLACK/TDDI	-	-
Operating temperature	-20 ~ +70	°C	-
Storage temperature	-30 ~ +80	°C	-
Module bonding technology	Optical Cement		

1.2 CTP Features

General Information Items	Specification	Unit	Note
	Main Panel		
Resolution	320(H)*480(V)	-	
Structure	TDDI	-	
Controller IC	AXS15231	-	
Interface	I2C	-	

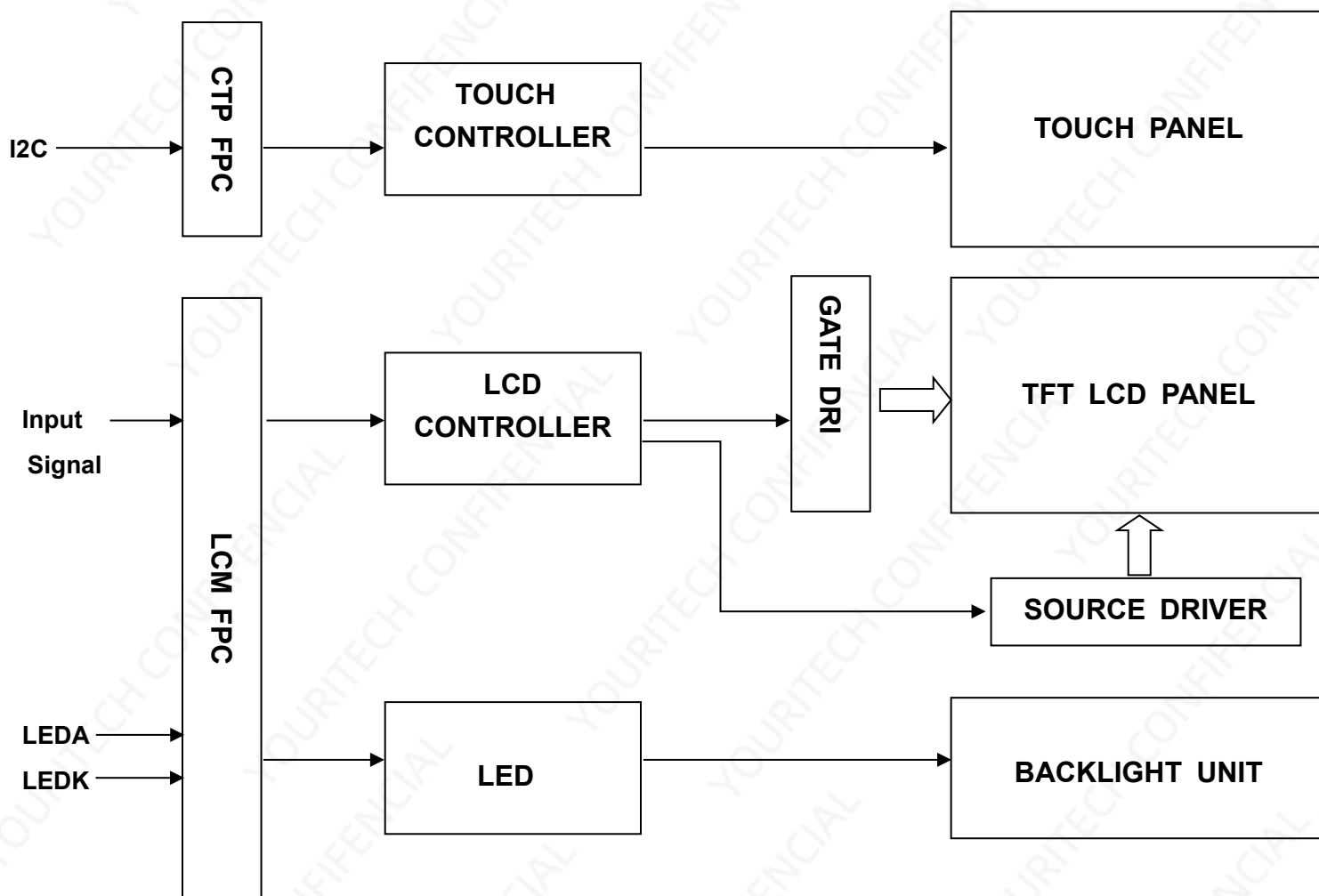


Slave Address	0x3B	-	
Touch mode	Multi-Touch	-	-
Logic level	3.3	V	

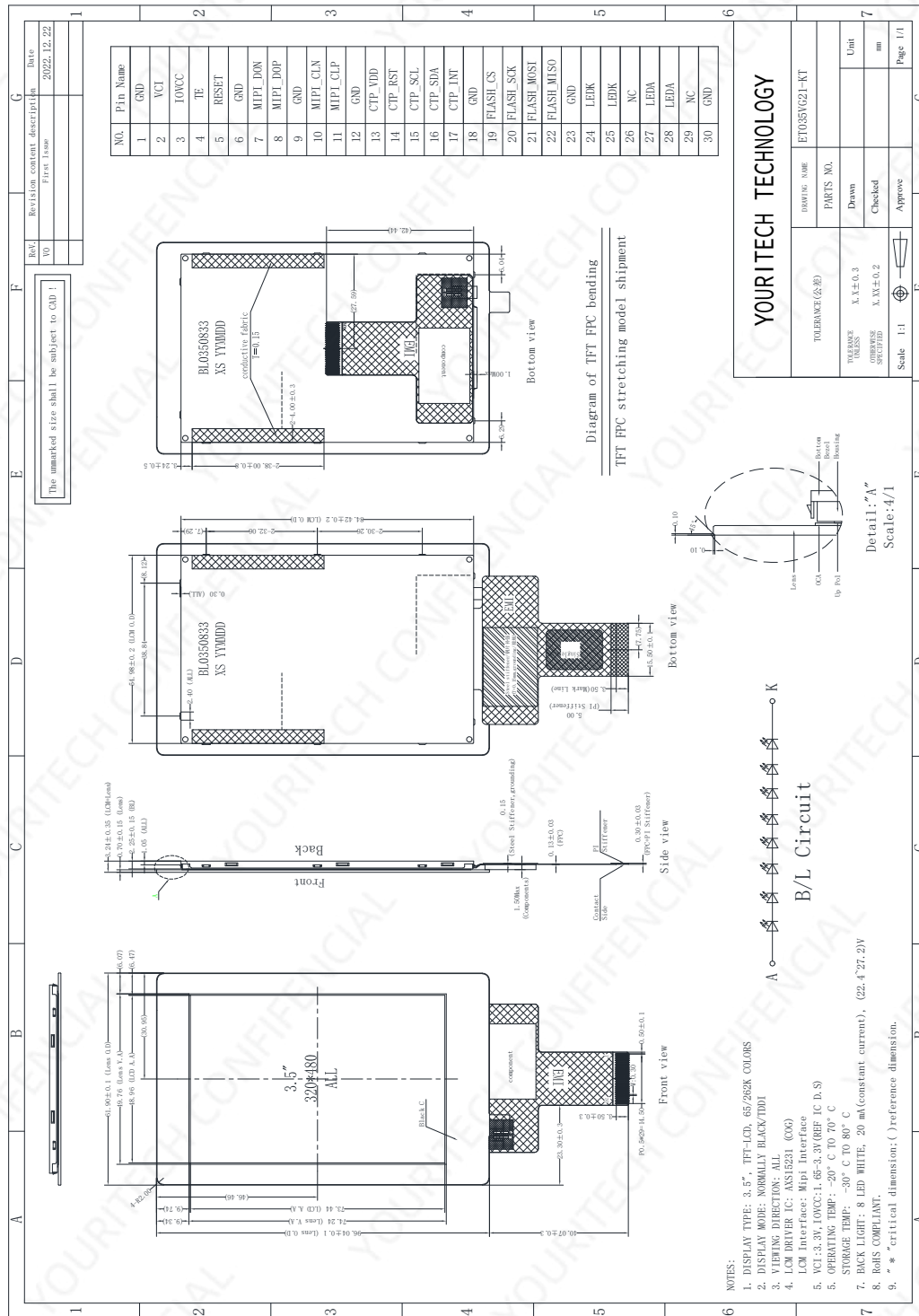
1.3 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		61.90		mm	-
	Vertical(V)		96.04		mm	-
	Depth(D)		3.24		mm	-
Weight			34		g	-

2. Block Diagram



3. Outline dimension



4. Input terminal Pin Assignment

4.1 TFT

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground.	
2	VCI	Supply Voltage (3.3V).	P
3	IOVCC	I/O power supply voltage.(1.8~3.3V)	
4	TE	-Tearing effect output Leave the pin to open when not in use.	P
5	RESET	- The external reset input. Initializes the chip with a low input. Be sure to execute a power-on reset after supplying power.	
6	GND	Ground.	P
7	MIPI_D0P	MIPI DSI differential clock pair (DSI-CLK+/-)..	P
8	MIPI_D0N		O
9	GND	Ground.	I
10	MIPI_CLP	MIPI DSI differential clock pair (DSI-CLK+/-)..	P
11	MIPI_CLN		I/O
12	GND	Ground.	I/O
13	CTP_VDD	Supply voltage.	P
14	CTP_RST	External Reset, Low is active.	I
15	CTP_SCL	I2C clock input.	I
16	CTP_SDA	I2C data input and output	P
17	CTP_INT	External interrupt to the host.	I/O
18	GND	Ground.	I/O
19	FLASH_CS	Open	P
20	FLASH_SCK	Open	P
21	FLASH_MOSI	Open	



22	FLASH_MISO	Open	
23	GND	Ground.	
24	LEDK	Cathode pin OF backlight	
25	LEDK	Cathode pin OF backlight	
26	NC	NC	
27	LEDA	Anode pin of backlight	
28	LEDA	Anode pin of backlight	
29	NC	NC	
30	GND	Ground.	



5. LCD Optical Characteristics

5.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	$\Theta=0$ Normal viewing angle	900	1100	--		*NOTE2
Response time	Rising	T_R+T_F		--	--	35	msec	*NOTE4
	Falling							
Color Gamut		S(%)		55	60	--	%	*NOTE1
Color Filter Chromaticity	White	W_X		0.3144	0.3164	0.3171		
		W_Y		0.3546	0.3571	0.3550		
	Red	R_X		0.6267	0.6258	0.6272		
		R_Y		0.3567	0.3568	0.3562		
	Green	G_X		0.3270	0.3282	0.3300		
		G_Y		0.5943	0.5932	0.5920		
	Blue	B_X		0.1495	0.1492	0.1497		
		B_Y		0.0903	0.0903	0.0916		
Viewing angle	Hor.	Θ_L	CR>10	80	85	--		*NOTE5
		Θ_R		80	85	--		
	Ver.	Θ_U		80	85	--		
		Θ_D		80	85	--		
Option View Direction		ALL						

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

Ambient temperature : $25\pm 2^\circ\text{C}$

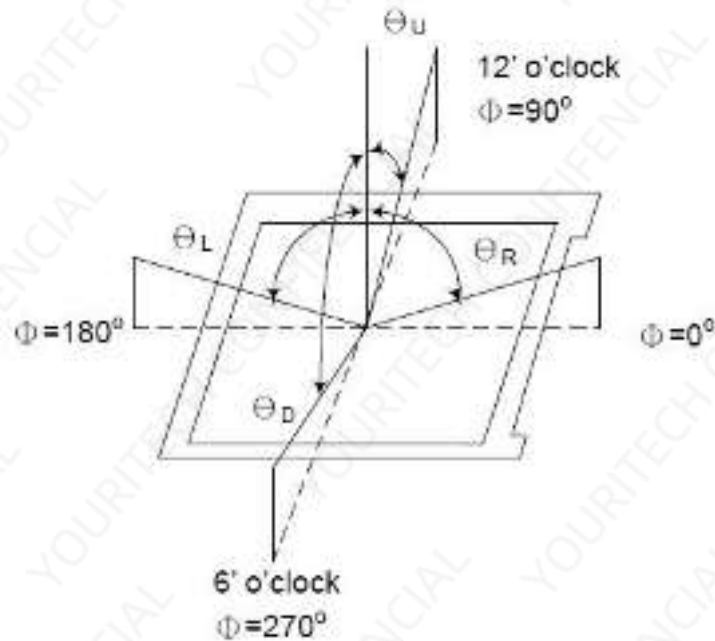
15min. warm-up time.

Measuring Equipment

FPM520 , which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.



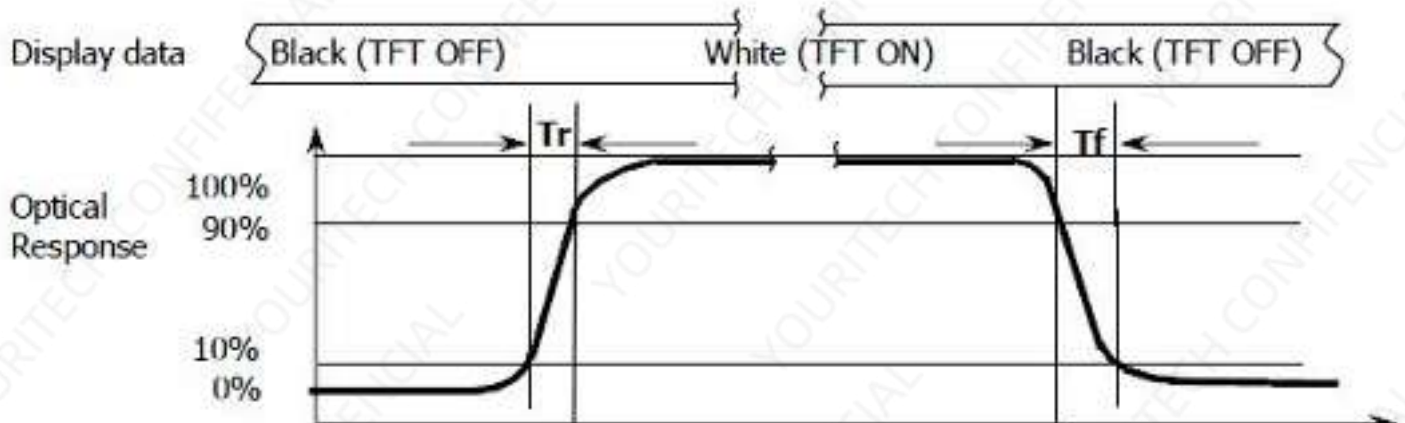
Note (1): Definition of Viewing Angle :



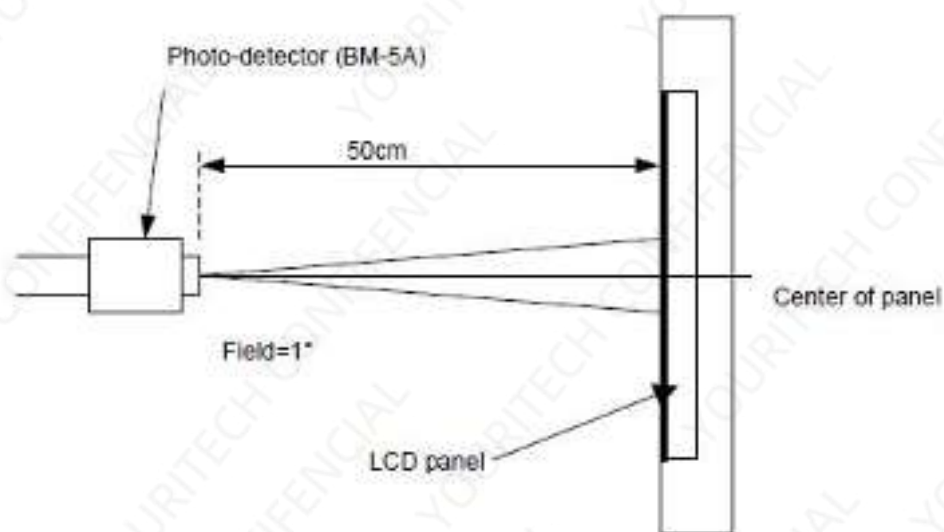
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3): Response Time



Note (4): Definition of optical measurement setup



6. Electrical Characteristics

6.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit
Digital Supply Voltage	VCI	3.0	3.6	V
Digital interface supply Voltage	IOVCC	1.65	3.6	V
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

6.2.1 DC Characteristics for Power Lines

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VCI	3	3.3	3.6	V	
	IOVCC	1.65	1.8	3.6	V	
Normal mode Current consumption	IDD	--	34	--	mA	
Level input voltage	V _{IH}	0.7 IOVCC	-	IOVCC	V	
	V _{IL}	GND	-	0.3 IOVCC	V	
Level output voltage	V _{OH}	0.7 IOVCC	-	VDD	V	
	V _{OL}	GND	-	0.3IOVCC	V	

Note:

1. Ta=-30°C to 70°C (to +85°C no damage)



6.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 8chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	--	20	--	mA	
Forward Voltage	V_F	22.4	24.45	27.2	V	
LCM Luminance	L_V	740	800	--	cd/m ²	Note3
LED life time	Hr	50000	--	--	Hour	Note1,2
Uniformity	AVg	80	--	--	%	Note3

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

$T_a = 25 \pm 3^\circ\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at

$T_a = 25^\circ\text{C}$ and $I_L = 20\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 160mA. The

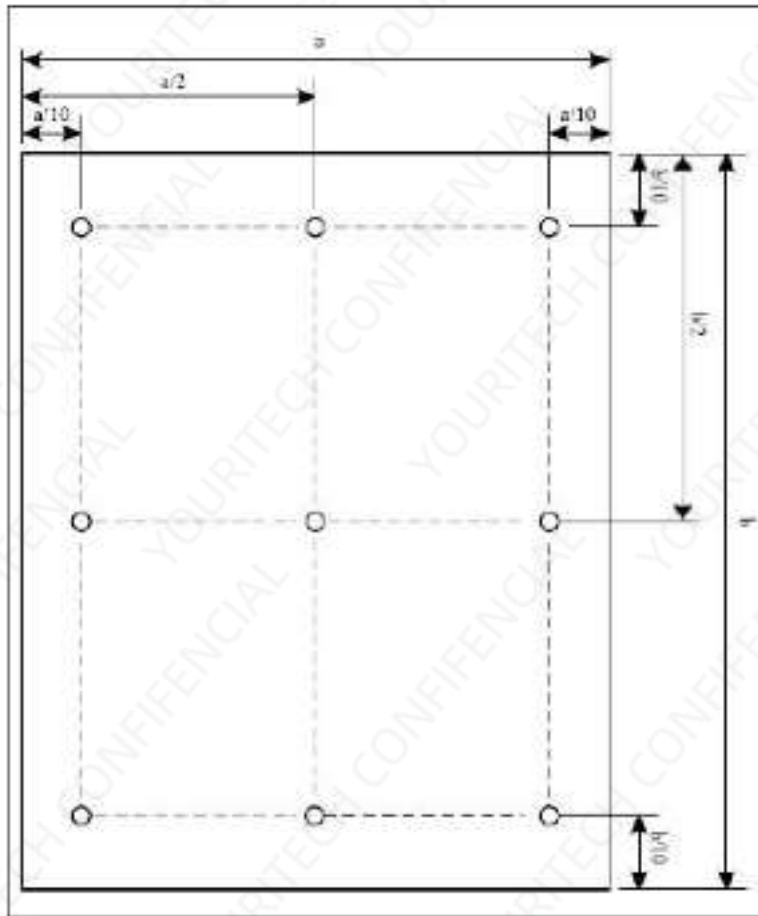
constant current driving method is suggested.



LED(B/L) CIRCUIT



NOTE 3: Luminance Uniformity of these 9 points is defined as below:



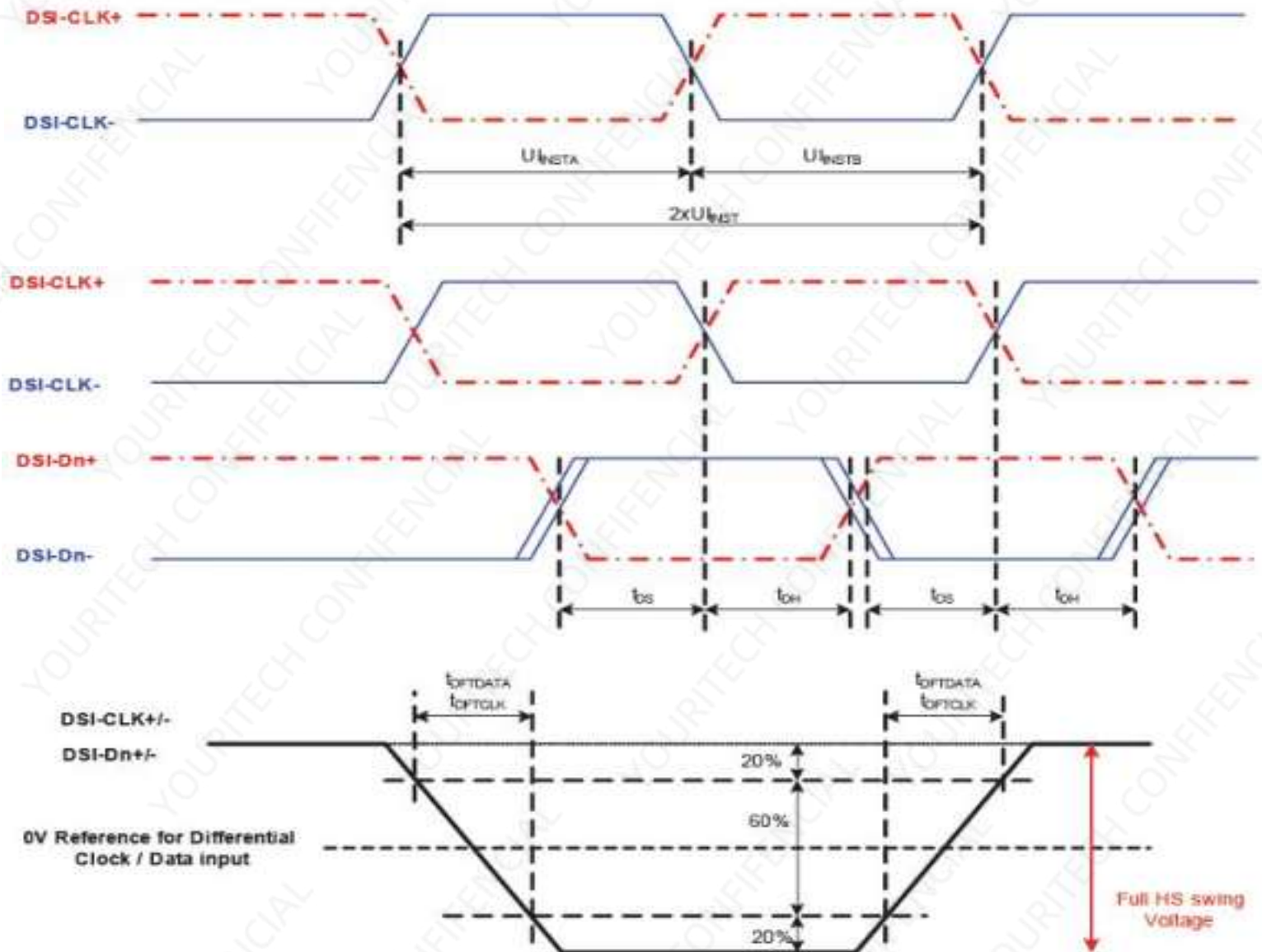
$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$



7. Timing Characteristics of the DSI

7.1 High speed mode



Parameter	Symbol	Parameter	Specification			Unit	Description
			MIN	TYP	MAX		
DSI-CLK+/-	$2 \times UI_{INSTA}$	Double UI instantaneous	TBD	TBD	TBD	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halves	TBD	TBD	TBD	ns	$UI = UI_{INSTA} = UI_{INSTB}$
DSI-D0+/-	T_{DS}	Data to clock setup time	TBD	TBD	TBD	UI	
DSI-D0+/-	T_{DH}	Data to clock hold time	TBD	TBD	TBD	UI	

Figure: AC characteristics for MIPI-DSI High speed mode



7.2 Low power mode

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Low Power Mode						
DSI-D0+/-	T _{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU Display Module	TBD	TBD	TBD	ns
DSI-D0+/-	T _{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module MPU	TBD	TBD	TBD	ns
DSI-D0+/-	T _{TA-SURED}	Time-out before the MPU start driving	TBD	TBD	TBD	ns
DSI-D0+/-	T _{TA-GETD}	Time to driver LP-00 by display module	TBD	TBD	TBD	ns
DSI-D0+/-	T _{TA-GOD}	Time to driver LP-00 after turnaround request - MPU	TBD	TBD	TBD	ns
DSI-D0+/-	Ratio T _{LPX}	Ratio of T _{LPXM} / T _{LPXD} between MCU and display module	TBD	TBD	TBD	

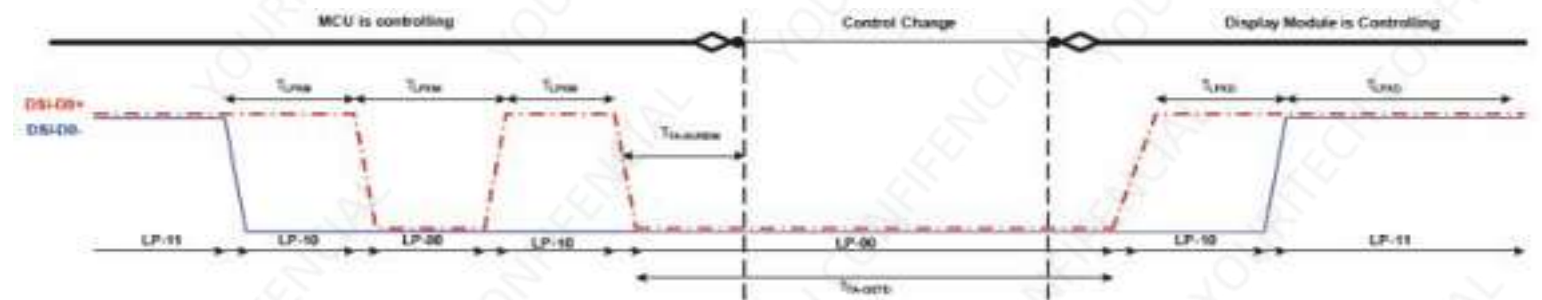


Figure: BTA from the MCU to the Display Module



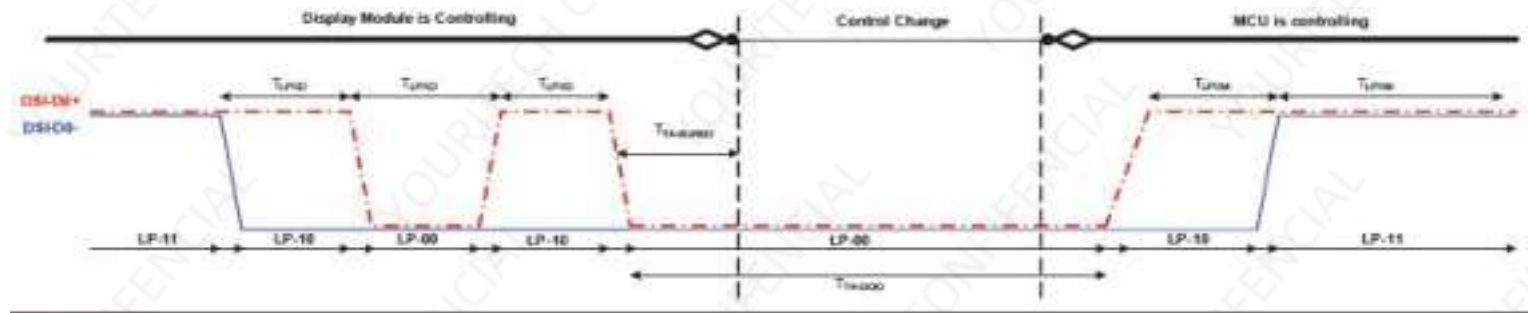


Figure: BTA from the Display Module to the MCU

7.3 Bursts

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed Data Transmission Bursts						
DSI-Dn+/-	T _{LPX}	Length of any low-power state period	TBD	TBD	TBD	ns
DSI-Dn+/-	T _{HS-PREPARE}	Time to driver LP-00 to prepare for HS transmission	TBD	TBD	TBD	ns
DSI-Dn+/-	T _{HS-PREPARE} + T _{HS}	T _{HS-PREPARE} + time to driver HS-0 before the sync sequence	TBD	TBD	TBD	ns
	ZERO					
DSI-Dn+/-	T _{D-TERM-EN}	Time to enable Data Lanereceiver line termination measured from when Dn crosses V _{IL(max)}	TBD	TBD	TBD	ns
DSI-Dn+/-	T _{HS-SKIP}	Time-out at RX to ignore transition period of EoT	TBD	TBD	TBD	ns
DSI-Dn+/-	T _{HS-TRAIL}	Time to driver flipped differential state after last payload data bit of a HS transmission burst	TBD	TBD	TBD	ns
DSI-Dn+/-	T _{HS-EXIT}	Time to driver LP-11 after HS burst	TBD	TBD	TBD	ns
DSI-Dn+/-	T _{EoT}	Time from start of T _{HS-TRAIL} Period to start of LP-11 state	TBD	TBD	TBD	ns



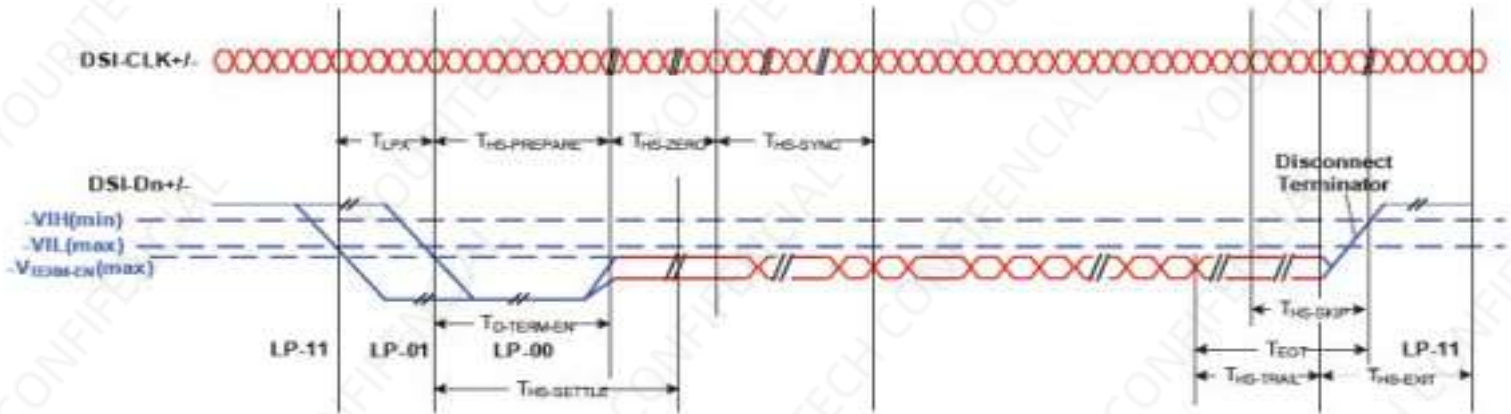


Figure: High Speed Data Transmission Bursts

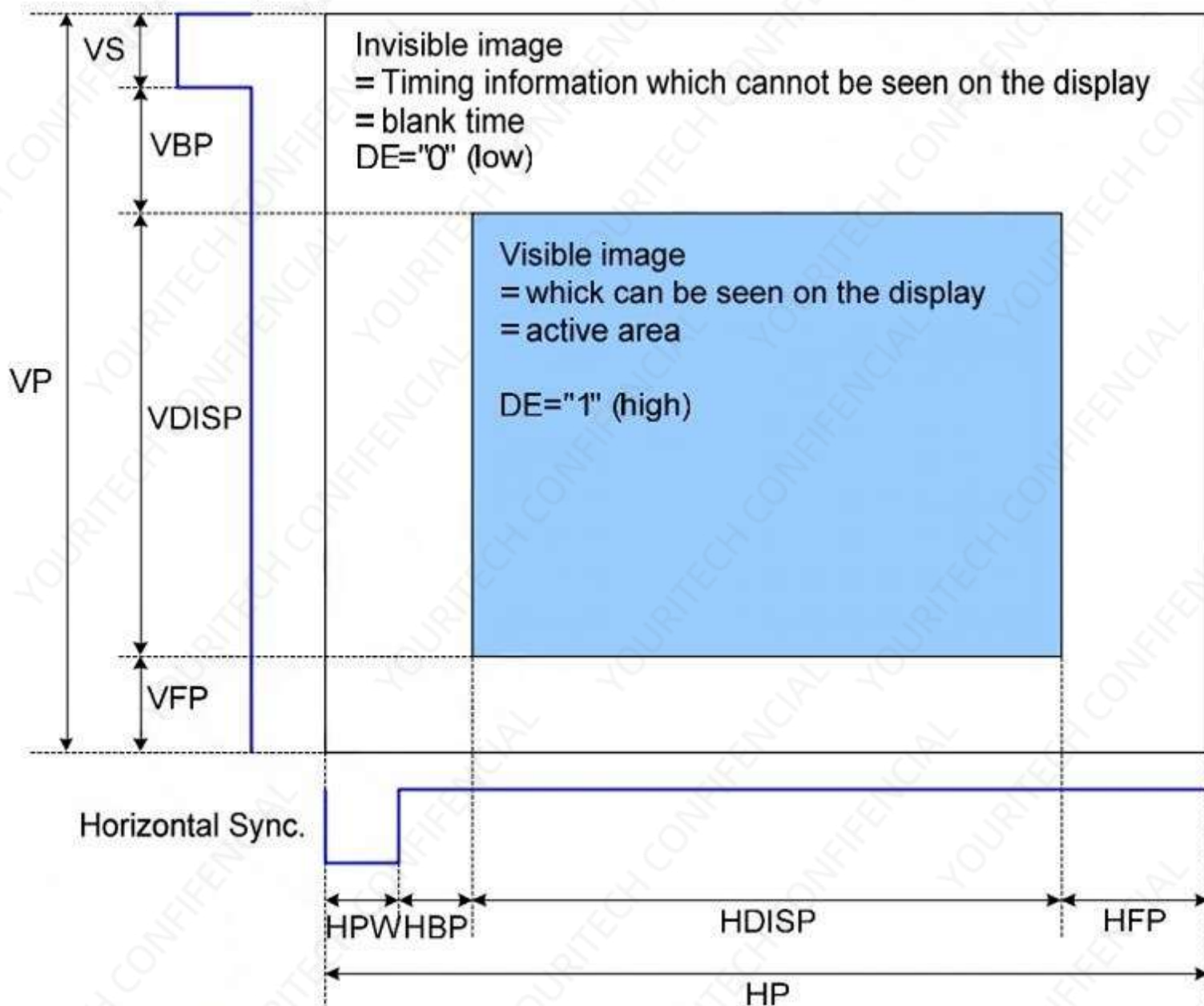
Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Switching the clock Lane between clock Transmission and Low Power Mode						
DSI-CLK+/-	T _{CLK-POST}	Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	TBD	TBD	TBD	ns
DSI-CLK+/-	T _{CLK-PRE}	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	TBD	TBD	TBD	UI
DSI-CLK+/-	T _{CLK-PREPARE}	Time to driver LP-00 to prepare for HS clock transmission	TBD	TBD	TBD	ns
DSI-CLK+/-	T _{CLK-TERM-EN}	Time to enable Clock Lane receiver line termination measured from when Dn crosses V _{IL(max)}	TBD	TBD	TBD	ns



7.4 RGB Interface Definition

The display operation via the RGB interface is synchronized with the VSYNC, HSYNC, and DOTCLK signals. The data can be written only within

Vertical Sync.



the specified area with low power consumption by using window address function. The back porch and front porch are used to set the RGB interface timing.



DRAM Access Area by RGB Interface

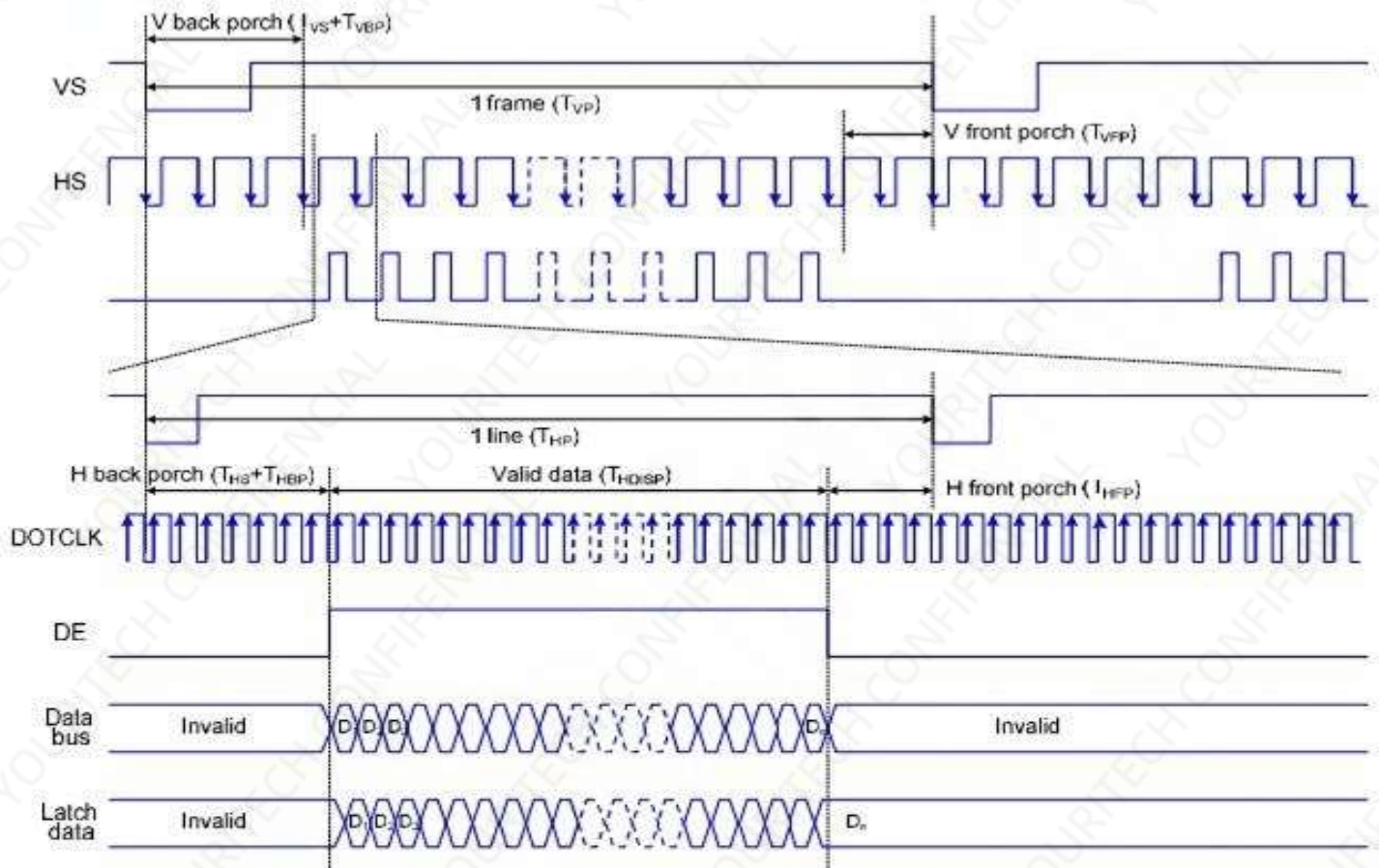
Please refer to the following table for the setting limitation of RGB interface signals.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Horizontal Sync.Width	hpw	--	41	--	Clock
Horizontal Sync.Back Porch	hbp	--	50	--	Clock
Horizontal Sync.Front Porch	hfp	--	80	--	Clock
Vertical Sync. Width	vsw	--	60	--	Line
Vertical Sync.Back Porch	vbp	--	50	--	Line
Vertical Sync. Front Porch	vfp	--	60	--	Line



7.5 RGB Interface Timing

The timing chart of RGB interface DE mode is shown as follows.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

VSYNC, HSYNC, and DOTCLK signals must be supplied during a display operation period.

In RGB interface mode, the panel controlling signals are generated from DOTCLK, not the internal clock generated from the internal oscillator.

When switching between the internal operation mode and the external display interface operation mode, follow the sequences below in setting instruction.

In RGB interface mode, the front porch period continues until the next VSYNC input is detected after drawing one frame. In RGB interface mode, a RAM address is set in the address counter every frame on the falling edge of VSYNC.



8.CTP Specification

8.1 Electrical Characteristics

8.1.1 Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	3	3.6	V	
Operating temperature	T _{OP}	-20	+70	°C	
Storage temperature	T _{ST}	-30	+80	°C	

NOTES:

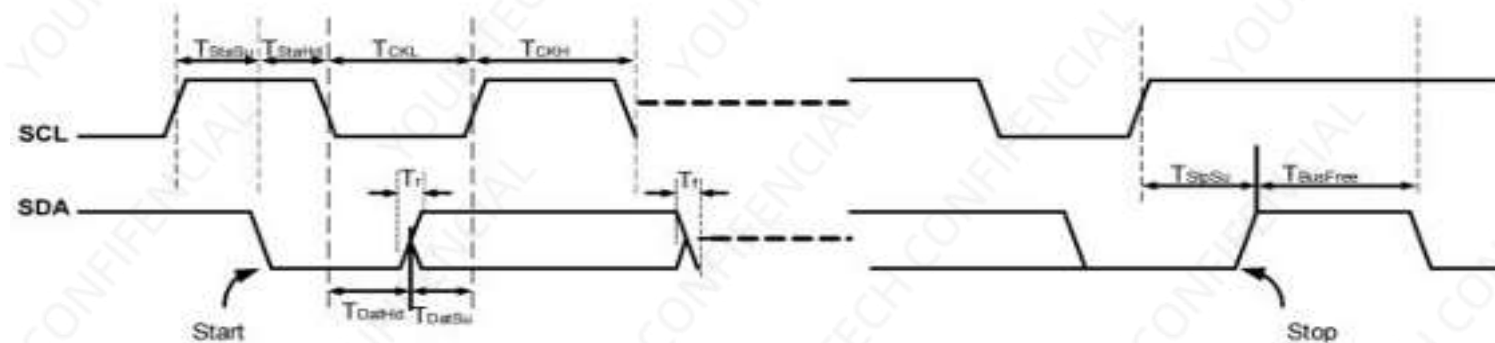
1. If used beyond the absolute maximum ratings, HY4614 may be permanently damaged. It is strongly recommended that the device be used within the electrical characteristics in normal operations. If exposed to the condition not within the electrical characteristics, it may affect the reliability of the device.

8.1.2 DC Electrical Characteristics (Ta=25°C)

Item	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage/VDD	3	3.3	3.6	V	
Normal mode operating current	--	TBD	--	mA	
Sleep mode operating current	--	TBD	--	uA	
Monitor mode operating current	--	TBD	--	mA	
Digital Input low voltage/VIL	TBD	--	TBD	V	
Digital Input high voltage/VIH	TBD	--	TBD	V	
Digital Output low voltage/VOL	--	--	TBD	V	
Digital Output high voltage/VOH	TBD	--	--	V	



8.2 I2C Interface

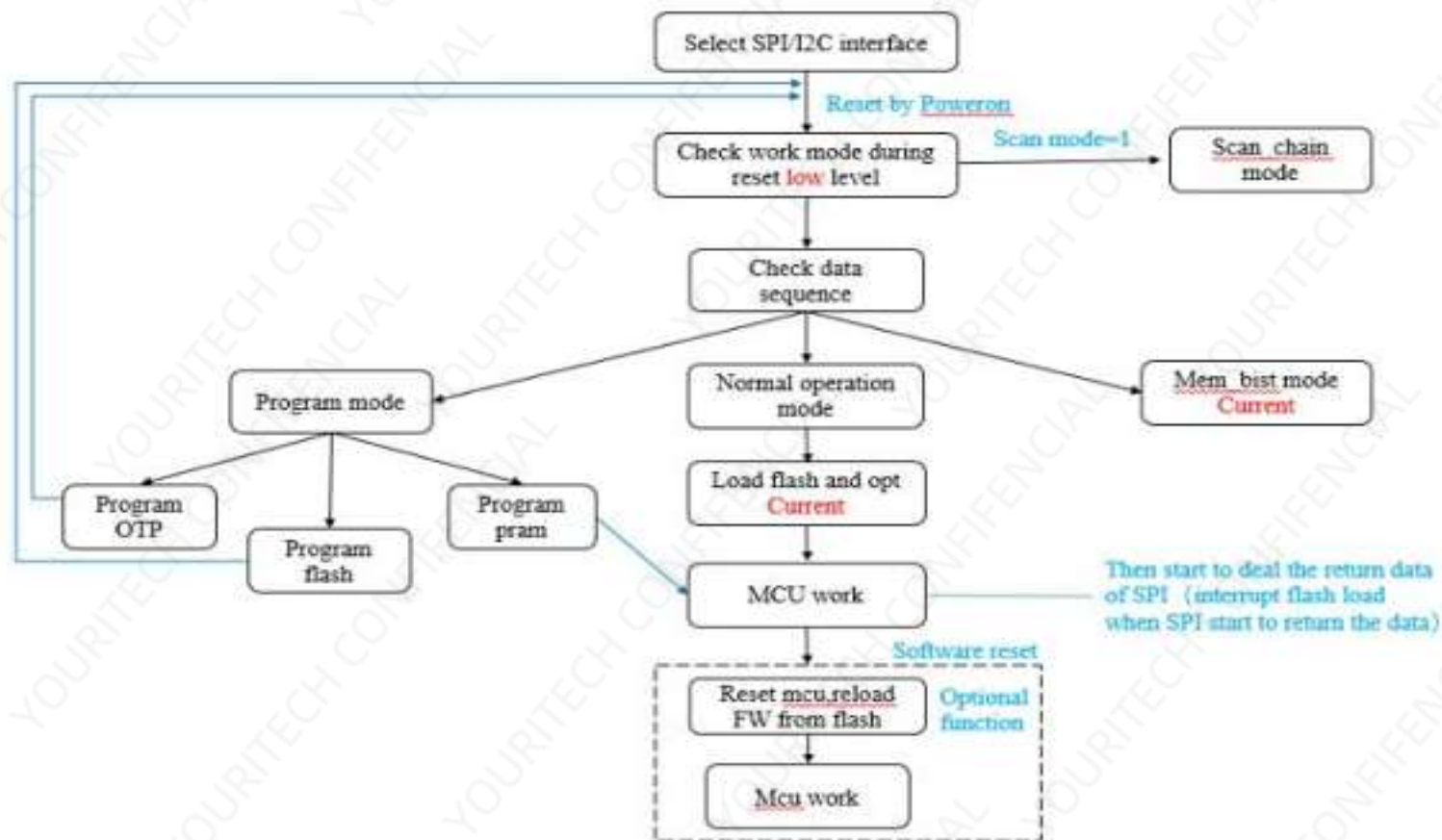


Parameter	Symbol	Min.	Typ	Max.	Unit
Working Frequency	F_{clk}	20	-	400	Khz
I2C Clock Low	T_{CKL}	1300	-	-	ns
I2C Clock High	T_{CKH}	600	-	-	ns
I2C Clock and Data rising time	T_r	-	-	300	ns
I2C Clock and Data falling time	T_f	-	-	300	ns
I2C Data hold time	T_{DatHd}	0	-	-	ns
I2C Data setup time	T_{DatSu}	100	-	-	ns
I2C Start Condition hold time	T_{StaHd}	600	-	-	ns
I2C Start Condition setup time	T_{StaSu}	600	-	-	ns
I2C Stop Condition setup time	T_{StpSu}	600	-	-	ns
I2C Bus free time	$T_{BusFree}$	1300	-	-	ns



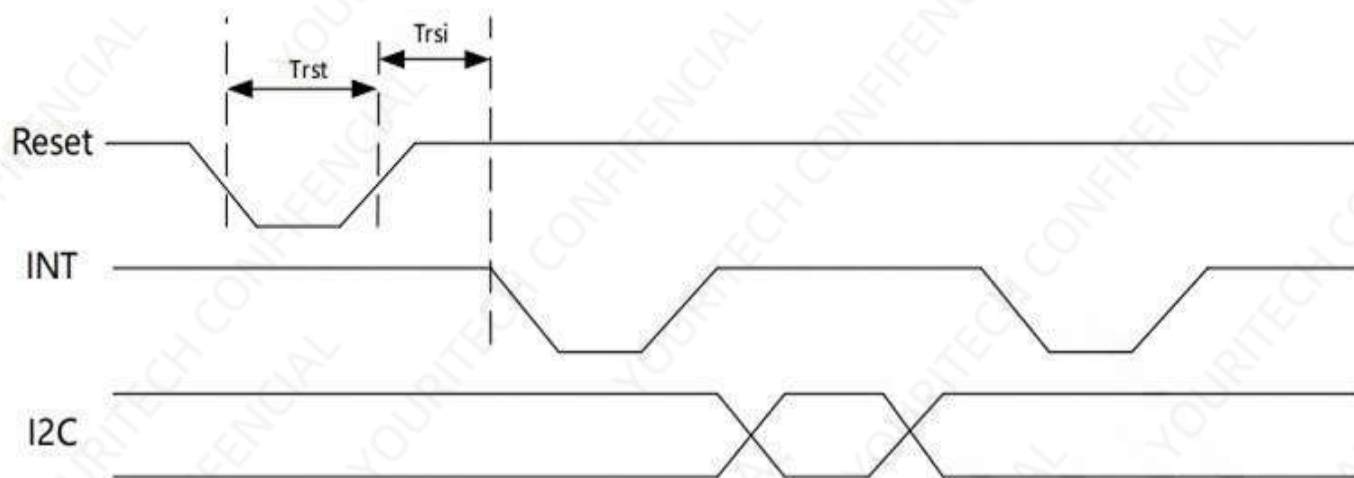
8.3 TP work flow

First, select the SPI or I2C interface to work through the work mode PIN. Then Write program into flash or pram with a different interface; Finally, please reset if writing program into flash or otp, and directly enter into MCU work mode if writing program into pram.



8.4 Touch Reset (RSTN) input timing

Reset time must be enough to guarantee reliable reset.



Parameter	Description	Min	Max	Units
T_{rsi}	Time of starting to report point after resetting	200	--	ms
T_{rst}	Reset time	5	--	ms



9. LCD Module Out-Going Quality Level

9.1 VISUAL & FUNCTION INSPECTION STANDARD

9.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

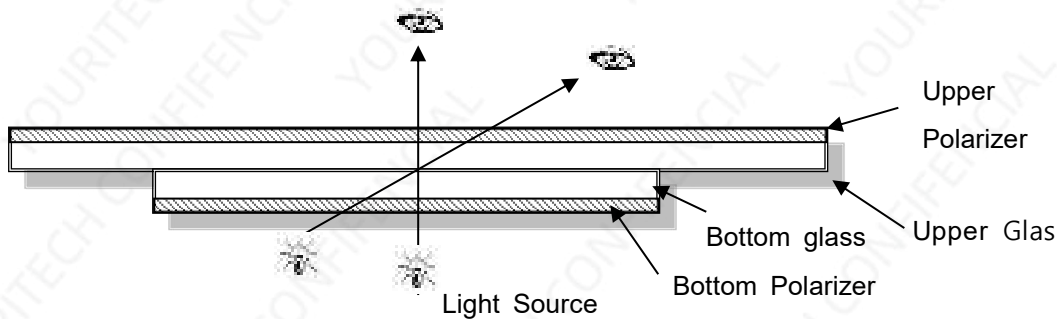
Temperature : $25\pm 5^{\circ}\text{C}$

Humidity : $65\%\pm 10\%\text{RH}$

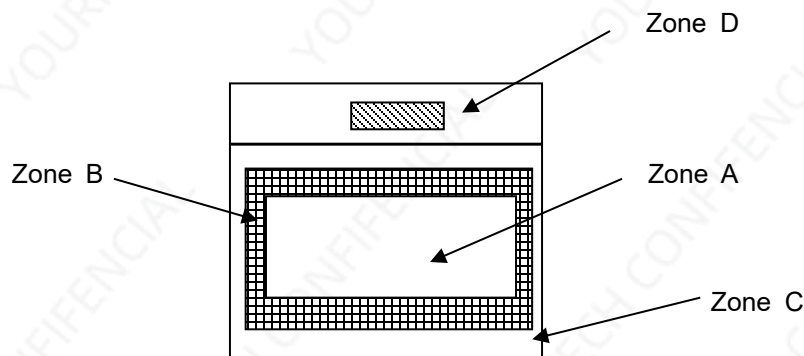
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



9.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer

Zone D : IC Bonding Area

Note:As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer



9.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

AQL:

Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , LCM: Liquid Crystal Module, CTP: Capacitive Touch Panel

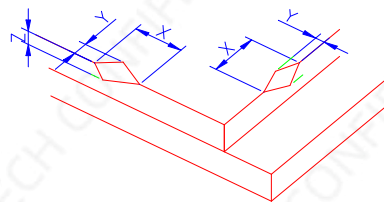
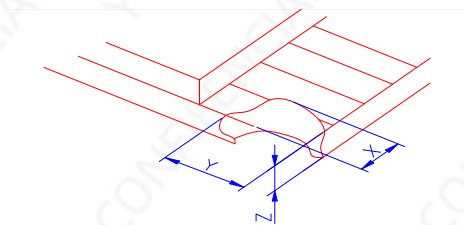
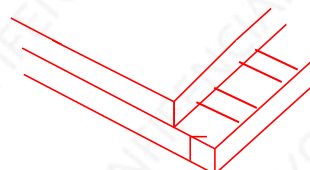
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. etc	Major
2	Missing	Missing components and etc	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed, deformation and etc	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot/Line defect	Light dot, Dim spot, (Note1) Polarizer Air Bubble, Polarizer accidented spot and etc.	
6	Soldering appearance	Good soldering , Peeling off is not allowed and etc.	
7	LCD/Polarizer/CTP	Black/White spot/line, scratch, crack, etc.	

Note1: a) Light dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

b) Dim dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.



9.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of IT O, T: Height of LCD	(1) The edge of LCD broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
	X	Y	Z					
	≤3.0mm	<Inner border line of the seal	≤T					
(2)LCD corner broken	 <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table>	X	Y	Z	≤3.0mm	≤L	≤T	
X	Y	Z						
≤3.0mm	≤L	≤T						
(3) LCD crack	 Crack Not allowed							



Spot defect

2.0

Φ=(X+Y)/2

① light dot (black/white spot , pinhole, stain, etc.)

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance ≥ 10mm)		
0.25<Φ≤0.4	2(distance ≥ 10mm)		
Φ>0.4	0		

② Dim spot (light leakage、dent、dark spot, etc)

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance ≥ 10mm)		
0.25<Φ≤0.4	2(distance ≥ 10mm)		
Φ>0.4	0		

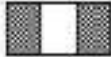
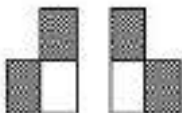
③ Polarizer accidented spot

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.5	2(distance ≥ 10mm)		
Φ>0.5	0		

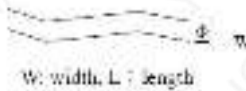
④Polarizer Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.4	3(distance ≥ 10mm)		
Φ>0.4	0		



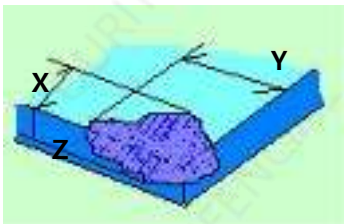
3.0	LCD Pixel defect	Pixel bad points																							
		<table> <tr> <th>Item</th><th>Zone A</th><th>Acceptable Qt</th></tr> <tr> <td rowspan="3">Bright dot</td><td>Random</td><td>$N \leq 2$</td></tr> <tr> <td>2 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>3 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td rowspan="3">Dark dot</td><td>Random</td><td>$N \leq 2$</td></tr> <tr> <td>2 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>3 dots adjacent</td><td>$N \leq 0$</td></tr> <tr> <td>Distance</td><td> 1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot. </td><td>5mm</td></tr> <tr> <td colspan="2">Total bright and dark dot</td><td>$N \leq 4$</td></tr> </table> Note: A) Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. B) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture. C) 2 dot adjacent = 1 pair = 2 dots Picture:   2 dot adjacent 2 dot adjacent (vertical)   2 dot adjacent 2 dot adjacent (slant)	Item	Zone A	Acceptable Qt	Bright dot	Random	$N \leq 2$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	Dark dot	Random	$N \leq 2$	2 dots adjacent	$N \leq 0$	3 dots adjacent	$N \leq 0$	Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm	Total bright and dark dot		$N \leq 4$
Item	Zone A	Acceptable Qt																							
Bright dot	Random	$N \leq 2$																							
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	2 dots adjacent	$N \leq 0$																							
	3 dots adjacent	$N \leq 0$																							
Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm																							
Total bright and dark dot		$N \leq 4$																							



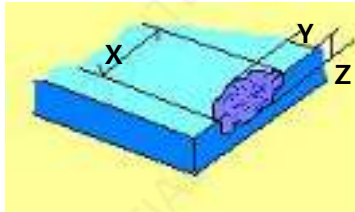
4.0	Line defect (LCD /Polarizer backlight black/white line, scratch, stain)  W: width, L: length N : Count	<table><tr><th rowspan="2">Width(mm)</th><th rowspan="2">Length(m)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>$\Phi \leq 0.05$</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$0.05 < W \leq 0.06$</td><td>$L \leq 4.0$</td><td colspan="2">$N \leq 3$</td></tr><tr><td>$0.06 < W \leq 0.08$</td><td>$L \leq 3.0$</td><td colspan="2">$N \leq 2$</td></tr><tr><td>$W > 0.08$</td><td colspan="4">Define as spot defect</td></tr></table>	Width(mm)	Length(m)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore		Ignore	$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$		$0.06 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$		$W > 0.08$	Define as spot defect			
Width(mm)	Length(m)	Acceptable Qty																										
		A	B	C																								
$\Phi \leq 0.05$	Ignore	Ignore		Ignore																								
$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$																										
$0.06 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$																										
$W > 0.08$	Define as spot defect																											
5.0	Electronic Components SMT.	Not allow missing parts, solderless connection, cold solder joint, mismatch, The positive and negative polarity opposite																										
6.0	Display color& Brightness.	1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.																										
7.0	LCD Mura/Waving/ Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.																										

8.0	CTP Related	CTP Cover sensor acc identified black/white spot	Acceptable Qty			
			A	B	C	
			Ignore			Ignore
			0 (distance > 10mm)			
			0 (distance > 10mm)			
0						



		CTP Cover scratch	<table><tr><td rowspan="2">Width(mm)</td><td rowspan="2">Ignore (mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>$\Phi \leq 0.05$</td><td>Ignore</td><td colspan="3">Ignore</td></tr><tr><td>$0.05 < W \leq 0.06$</td><td>$L \leq 4.0$</td><td colspan="3">$N \leq 3$</td></tr><tr><td>$0.06 < W \leq 0.08$</td><td>$L \leq 3.0$</td><td colspan="3">$N \leq 2$</td></tr><tr><td>$0.08 < W$</td><td colspan="5">Define as spot defect</td></tr></table>			Width(mm)	Ignore (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore			$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$			$0.06 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$			$0.08 < W$	Define as spot defect					
			Width(mm)	Ignore (mm)	Acceptable Qty																														
					A	B	C																												
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		$0.06 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$																															
		$0.08 < W$	Define as spot defect																																
		CTP Cover Pinhole/ Lack of ink	<table><tr><td rowspan="5"> Zone Size (mm) </td><td colspan="3">Acceptable Qty</td></tr><tr><td colspan="3">C</td></tr><tr><td colspan="3">Ignore</td></tr><tr><td colspan="3">$3(\text{distance} \geq 10\text{mm})$</td></tr><tr><td colspan="3">$2(\text{distance} \geq 10\text{mm})$</td></tr><tr><td colspan="3">0</td></tr></table>					Zone Size (mm)	Acceptable Qty			C			Ignore			$3(\text{distance} \geq 10\text{mm})$			$2(\text{distance} \geq 10\text{mm})$			0											
			Zone Size (mm)	Acceptable Qty																															
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CTP Bondi ng bubble/ accidented spot	<table><tr><td rowspan="2">Size $\Phi(\text{mm})$</td><td colspan="3">Acceptable Qty</td></tr><tr><td>A</td><td colspan="2">B</td></tr><tr><td>$\Phi \leq 0.1$</td><td colspan="3">Ignore</td></tr><tr><td>$0.1 < \Phi \leq 0.2$</td><td colspan="3">$3(\text{distance} \geq 10\text{mm})$</td></tr><tr><td>$0.2 < \Phi \leq 0.25$</td><td colspan="3">$2(\text{distance} \geq 10\text{mm})$</td></tr><tr><td>$\Phi > 0.25$</td><td colspan="3">$0$</td></tr></table>					Size $\Phi(\text{mm})$	Acceptable Qty			A	B		$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	$3(\text{distance} \geq 10\text{mm})$			$0.2 < \Phi \leq 0.25$	$2(\text{distance} \geq 10\text{mm})$			$\Phi > 0.25$	0									
	Size $\Phi(\text{mm})$	Acceptable Qty																																	
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$0.2 < \Phi \leq 0.25$	$2(\text{distance} \geq 10\text{mm})$																																		
$\Phi > 0.25$	0																																		
Assembly deflection	beyond the edge of backlight $\leq 0.2\text{mm}$																																		
CTP cover broken X : length Y : width Z : height	<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>$X \leq 0.5\text{mm}$</td><td>$Y \leq 0.5\text{mm}$</td><td><math>Z < \text{cover t hickness}</math></td></tr></table>			X	Y		Z	$X \leq 0.5\text{mm}$	$Y \leq 0.5\text{mm}$	$Z < \text{cover thickness}$																									
	X	Y	Z																																
	$X \leq 0.5\text{mm}$	$Y \leq 0.5\text{mm}$	$Z < \text{cover thickness}$																																
	* Circuitry broken is not allowed.																																		



		CTP cover broken	X	Y	Z	
			$X \leq 0.3\text{mm}$	$Y \leq 0.3\text{mm}$	$Z < \text{cover thickness}$	
		X : length	* Circuitry broken is not allowed.			
		Y : width				
		Z : height				

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	CTP no function	Not allowed



Item	Condition	Inspection after test
High Temperature Operating	70°C,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-20°C, 96HR	
High Temperature Storage	80°C, 96HR	
Low Temperature Storage	-30°C, 96HR	
High Temperature & High Humidity Storage	+60°C, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-30°C,30 min ↔ 70°C,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15°C~35°C, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80cm(MEDIUM BOX)	

10. Reliability Test Result

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 judged as a good part.
5. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Cautions and Handling Precautions

11.1 Handling and Operating the Module

- (1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
- (2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
- (3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
- (4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
- (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static; it may cause damage to the CMOS ICs.
- (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (10) Do not disassemble the module.
- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.
- (13) Do not connect, disconnect the module in the "Power ON" condition.
- (14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

11.2 Storage and Transportation.

- (1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
- (2) Do not store the TFT-LCD module in direct sunlight.
- (3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for

protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

