

Product Specification

Model Name	S043HWQ50HD
Description	Standard LCD Module 4.3" WQVGA 480(RGB)x272 Dots
Date	2023/4/17
Version	1.0

Approved by/Date	Check by/Date	Prepared by/Date
HL 2023/4/17	HXY 2023/4/17	MHY 2023/4/17

Customer Approval	
Date	

Table of Contents

1. Record of Revision	3
2. General Specifications	4
3. Input/Output Terminals	5
4. Absolute Maximum Rating	5
5. Electrical Characteristics	6
6. Interface Timing	8
7. Optical Characteristics	14
8. Environmental / Reliability Tests	18
9. Mechanical Drawing	19
10. Packing	20
11. TFT-LCD Module Inspection Criteria	21
12. Precautions for Use of LCD modules	27

1. Record of Revision

Rev	Issued Date	Description	Editor
1.0	2023/4/17	First Release.	MHY

2. General Specifications

	Feature	Spec
Characteristics	Size	4.3 inch
	Resolution	480(horizontal)*272(Vertical)
	Interface	RGB-24bit
	Connect type	Connector
	Display Colors	16.7M
	Technology type	a-Si
	Pixel pitch (mm)	0.198*0.198
	Pixel Configuration	R.G.B-Stripe
	Display Mode	Normally Black
	LCD Driver IC	SC7283-G4-1
	Viewing Direction	Full view
Mechanical	LCM (W x H x D) (mm)	105.50*67.20*2.95
	Active Area(mm)	95.04 x53.86
	Weight (g)	TBD
	LED Numbers	10 LEDs

Note 1: Requirements on Environmental Protection: RoHs

Note 2: LCM weight tolerance: +/- 5%

3. Input/Output Terminals

LCD PIN-MAP

No.	Symbol	Description
1	VBL-	Backlight LED Cathode
2	VBL+	Backlight LED Anode
3	GND	Ground
4	VDD	Power supply
5-12	R0-R7	Data bus
13-20	G0-G7	Data bus
21-28	B0-B7	Data bus
29	GND	Ground
30	DCLK	Dot clock signal input. Latching input data at its rising edge
31	DISP	Standby mode. Normally pulled high DISP="1": Normally operation (Default) DISP="0": Timing controller, source driver will turn off ,all output are High-Z
32	HSYNC	Horizontal sync input. Negative polarity
33	VSYNC	Vertical sync input. Negative polarity
34	DE	Data enable input. Active high to enable the input data bus under "DE Mode"
35	NC	No connect
36	GND	Ground
37	XR(NC)	The right side signal of TP
38	YD(NC)	The down side signal of TP
39	XL(NC)	The left side signal of TP
40	YU(NC)	The up side signal of TP

4. Absolute Maximum Rating

Item	Symbol	MIN	Typ	MAX	Unit	Remark
Supply Voltage	VDD	-0.5	-	5.0	V	-
Operating Temperature	TOPR	-30	-	85	℃	-
Storage Temperature	TSTG	-30	-	85	℃	

5. Electrical Characteristics

5.1 Driving TFT LCD Panel

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	VIL	GND	-	0.3x VDD	V	
	High Level	VIH	0.7x VDD	-	VDD	V	
Output Signal Voltage	Low Level	VIL	GND	-	VDD+0.4	V	
	High Level	VIH	VDD-0.4	-	VDD	V	
(Panel+LSI) Power Consumption		Black Mode (60Hz)	-	74		nW	
		Standby	-	50	-	uW	

5.2 LED Driving Conditions

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	40	-	mA	
Forward Voltage	V_F	13.5	-	17.0	V	
Backlight Power consumption	W_{BL}	0.54	-	0.68	W	
LED Lifetime		-	50000	-	Hrs	

Note 1: Each LED: $I_F = 20 \text{ mA}$, $V_F = 3.2 \pm 0.2 \text{ V}$.

Note 2: Optical performance should be evaluated at $T_a = 25^\circ\text{C}$ only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life Time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data

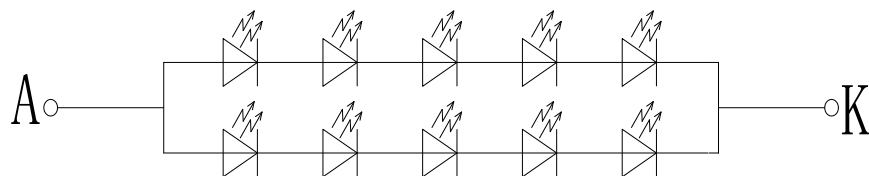
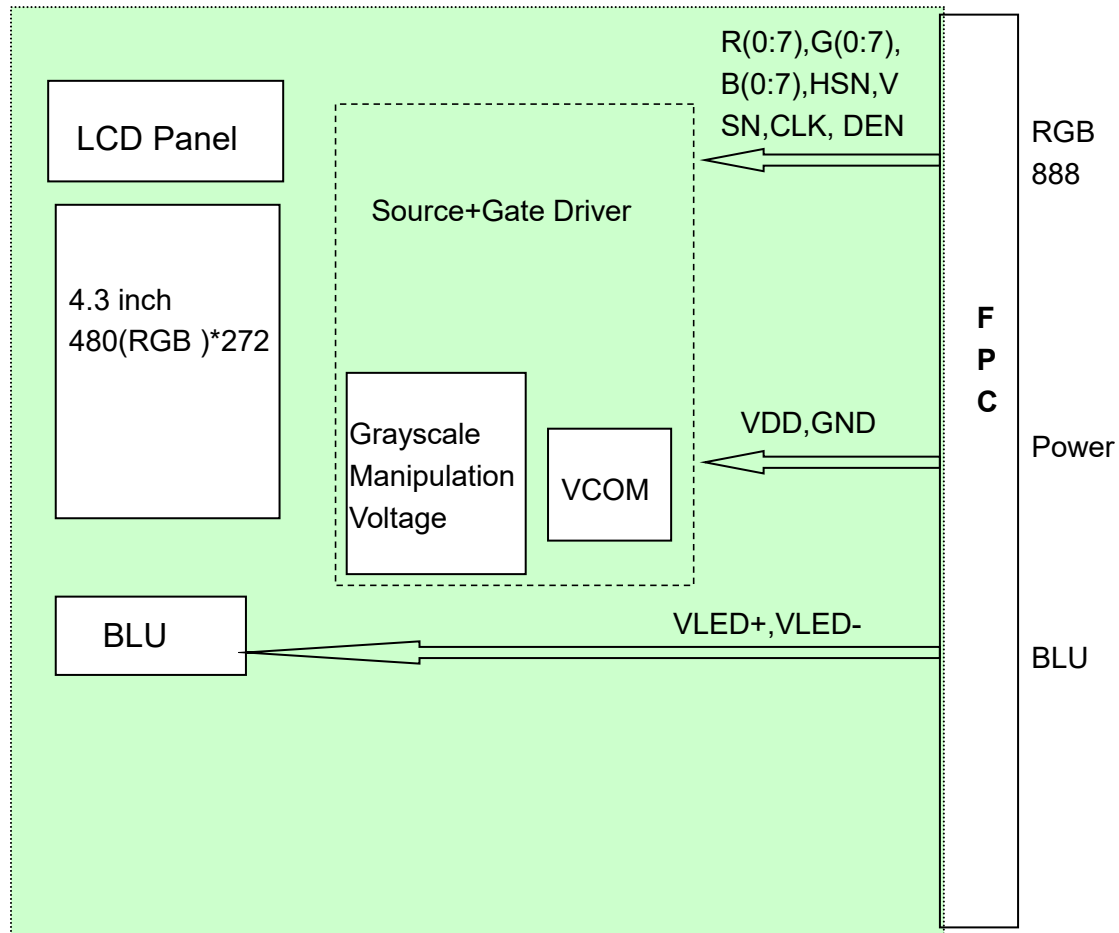


Figure: LED connection of backlight(Constant Current)

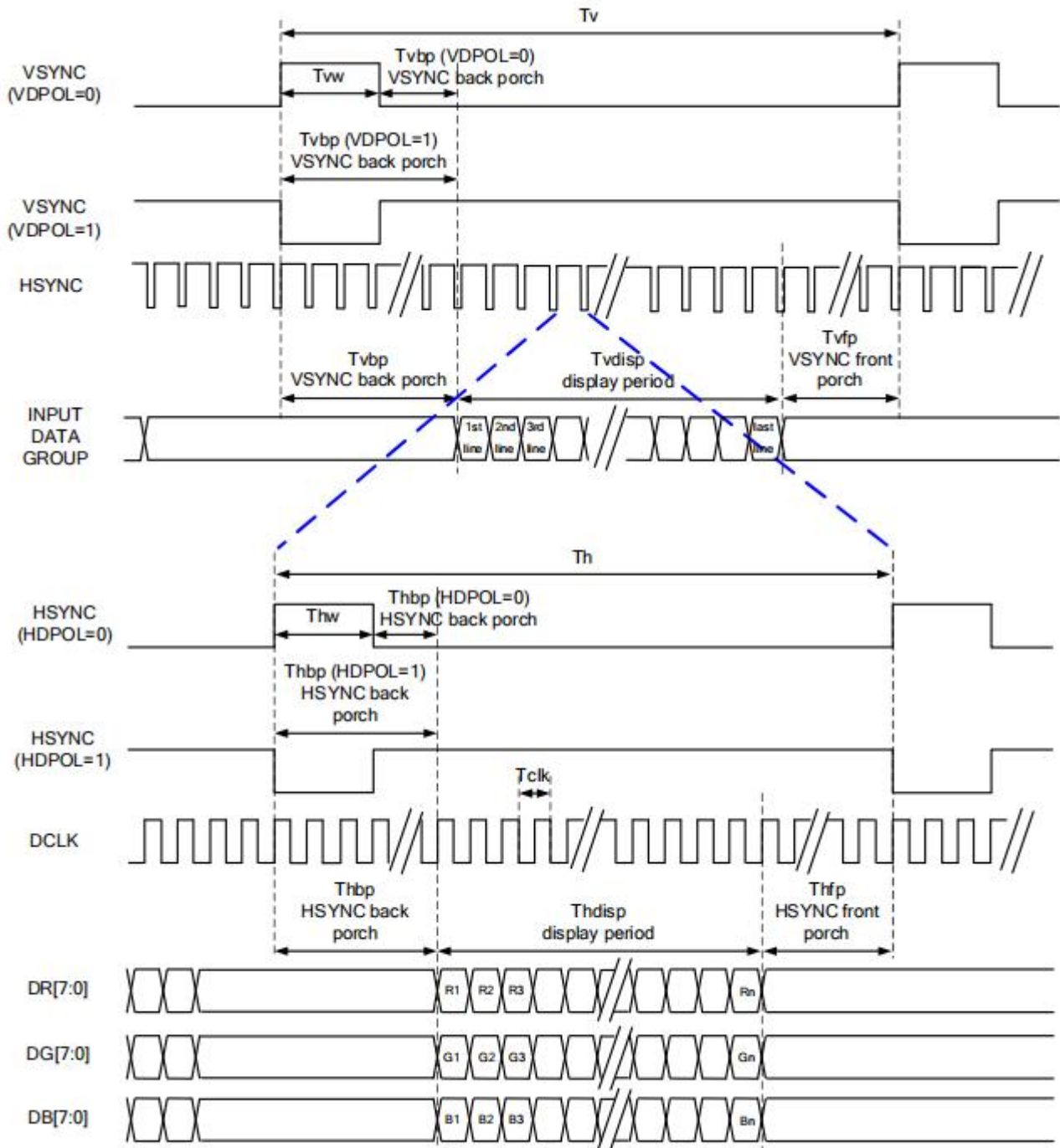
5.3 Block Diagram



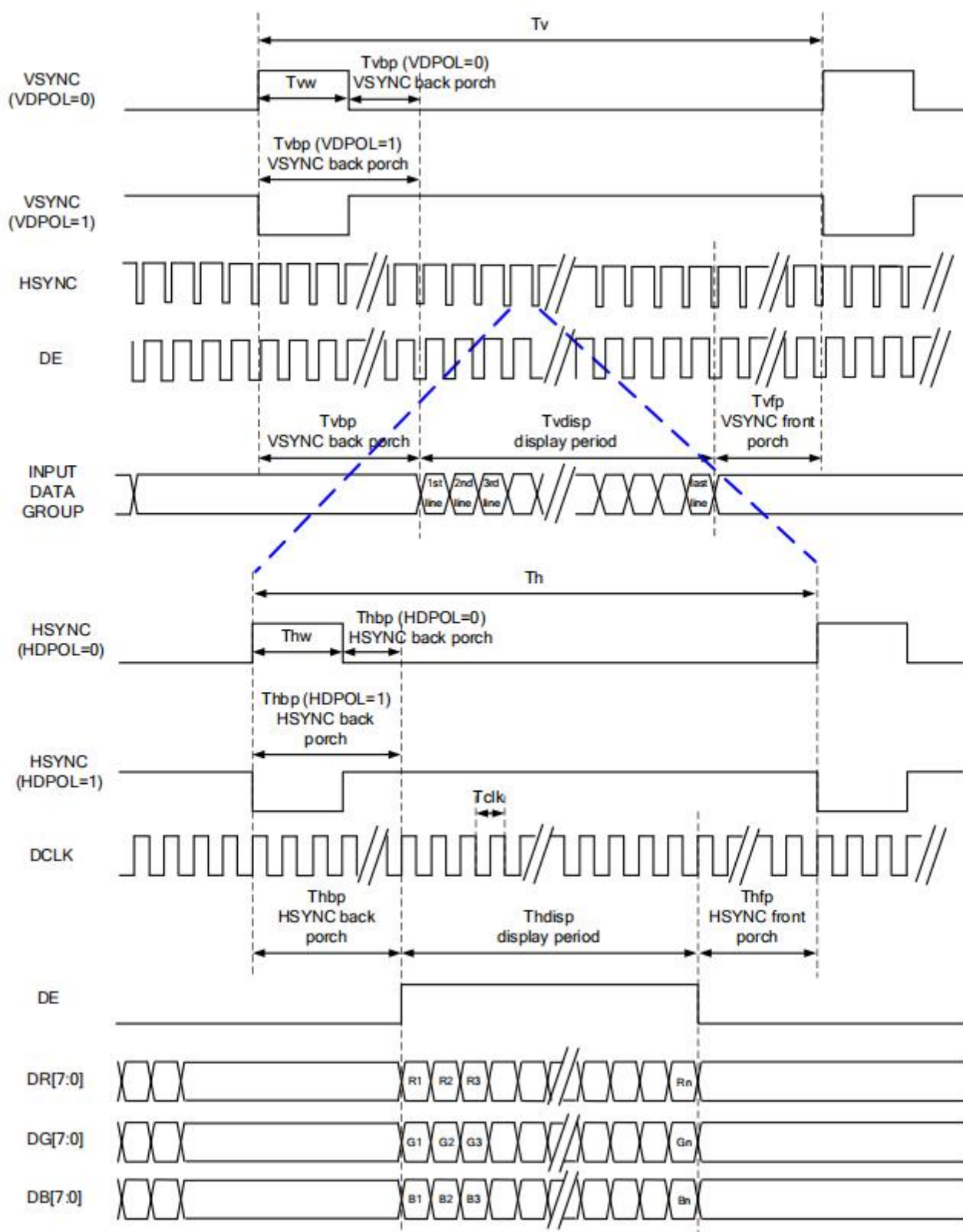
6. Interface Timing

6.1 RGB Interface

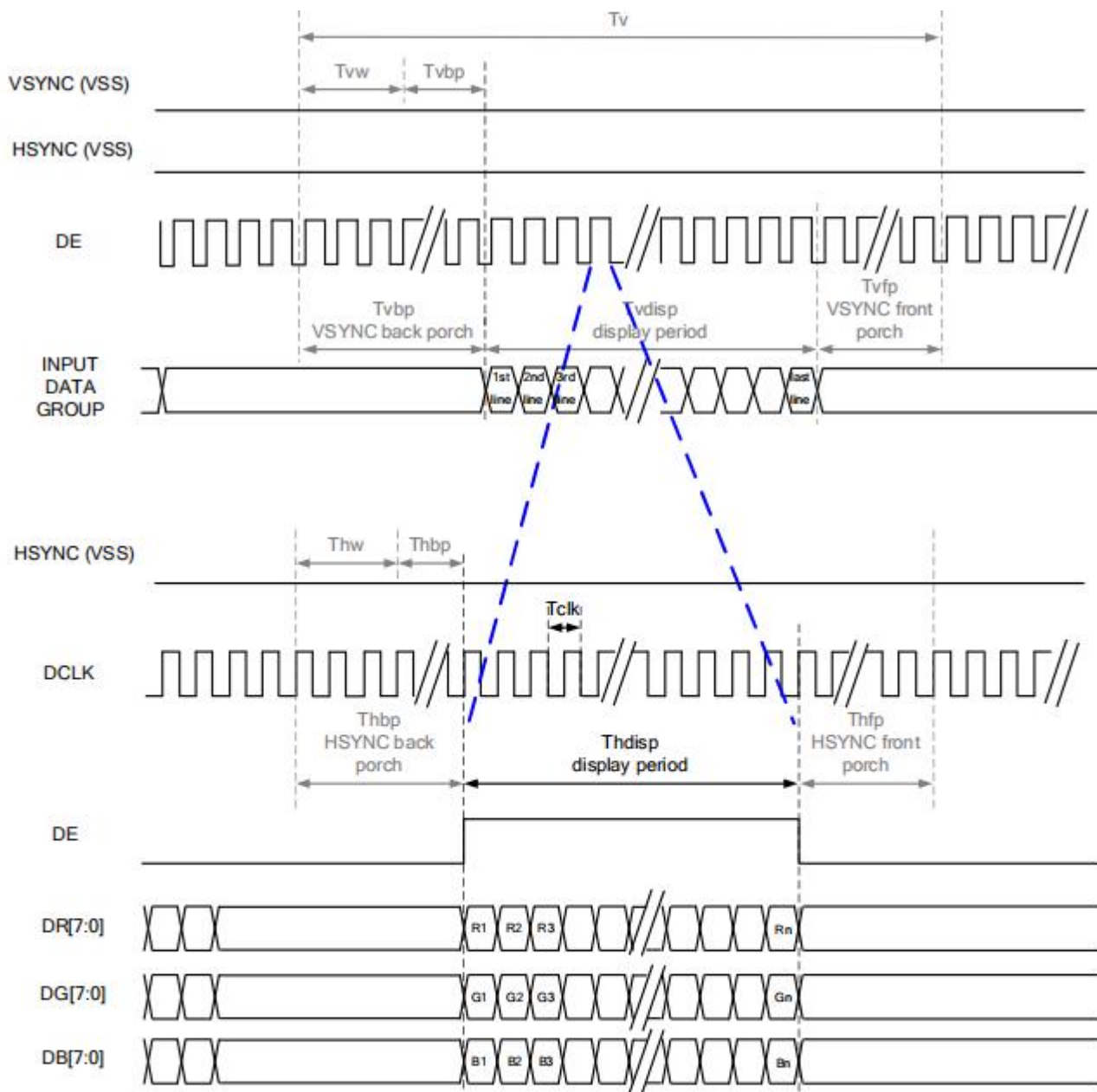
6.1.1 SYNC Mode



6.1.2 SYNC-DE Mode



6.1.3 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.

6.1.4 Parallel 24 bit RGB Input Timing Table

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	43	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	12	HSYNC	

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

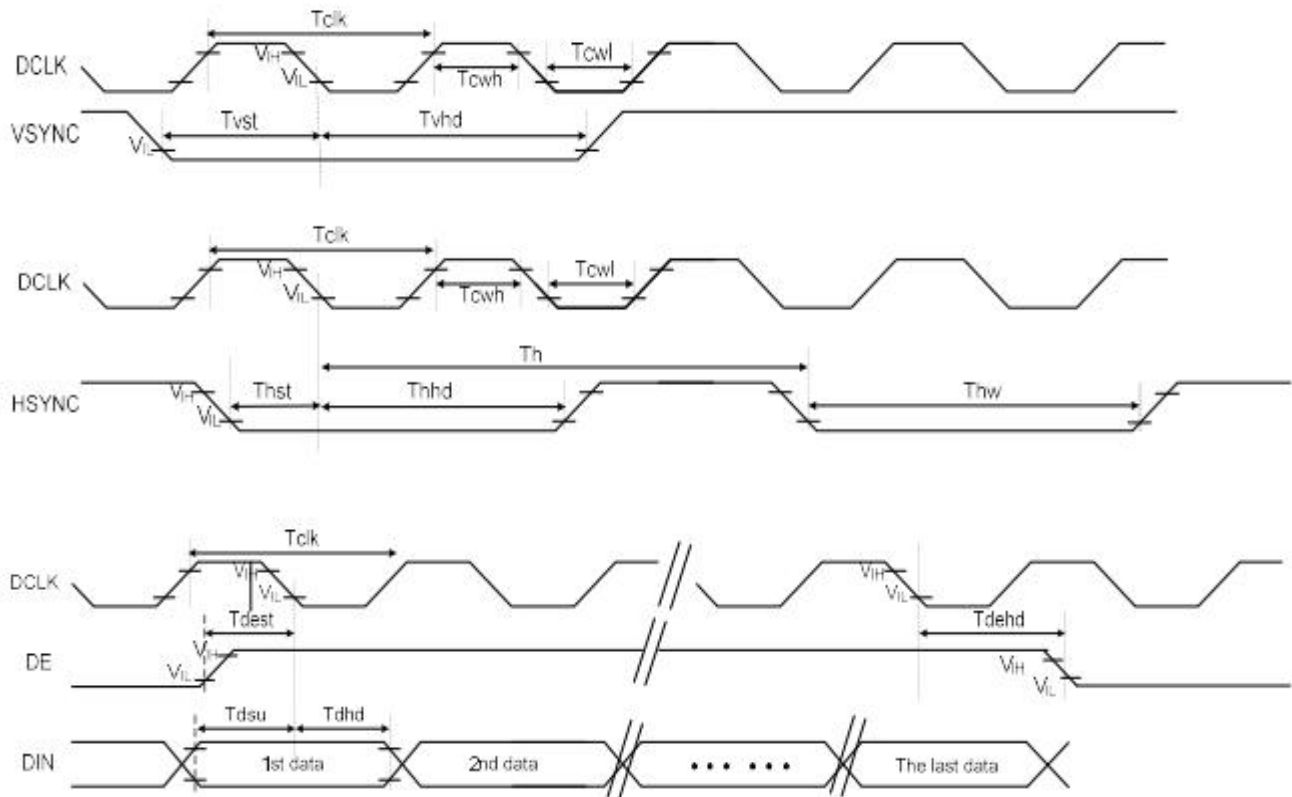
6.1.5 Serial 8 bit RGB Input Timing Table

Serial 8-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	24	27	30	MHz	
DCLK Period	Tclk	33	37	42	ns	
HSYNC	Period Time	Th	1445	1491	1558	DCLK
	Display Period	Thdisp		1440		DCLK
	Back Porch	Thbp	3	43	43	DCLK
	Front Porch	Thfp	2	8	75	DCLK
	Pulse Width	Thw	2	4	43	DCLK
VSYNC	Period Time	Tv	276	292	321	HSYNC
	Display Period	Tvdisp		272		HSYNC
	Back Porch	Tvbp	2	12	12	HSYNC
	Front Porch	Tvfp	2	8	37	HSYNC
	Pulse Width	Tvw	2	4	12	HSYNC

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

6.2 System Bus Timing for RGB Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	T_{cw}	40	50	60	%	
HSYNC Width	T_{hw}	2	-	-	DCLK	
HSYNC Period	T_h	55	60	65	us	
VSYNC Setup Time	T_{vst}	12	-	-	ns	
VSYNC Hold Time	T_{vhd}	12	-	-	ns	
HSYNC Setup Time	T_{hst}	12	-	-	ns	
HSYNC Hold Time	T_{hhd}	12	-	-	ns	
Data Setup Time	T_{dsu}	12	-	-	ns	
Data Hold Time	T_{dhhd}	12	-	-	ns	
DE Setup Time	T_{dest}	12	-	-	ns	
DE Hold Time	T_{dehd}	12	-	-	ns	

7. Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time		Tr+Tf	-	-	30	40	ms	FIG.1	Note4
Contrast Ratio		CR		600	800	-	-	FIG.2	Note1
Surface luminance		LV	$\theta=0^\circ$	450	500	-	cd/m ²	FIG.2	Note2
Luminance uniformity		Yu	$\theta=0^\circ$	75	80	-	%	FIG.2	Note3
NTSC		-	$\theta=0^\circ$	-	50	-	%	FIG.2	Note5
Viewing angle		θ_T	Center CR $\geq$ 10	-	80	-	deg	FIG.3	Note6
		θ_B		-	80	-	deg	FIG.3	
		θ_L		-	80	-	deg	FIG.3	
		θ_R		-	80	-	deg	FIG.3	
Chromaticity	Red	R _X	$\theta=0^\circ$ $\phi=0^\circ$ Ta=25 $^\circ$	0.550	0.600	0.650	-	FIG.2 CIE1931	Note5
		R _Y		0.280	0.330	0.380	-		
	Green	G _X		0.320	0.370	0.420	-		
		G _Y		0.510	0.560	0.610	-		
	Blue	B _X		0.087	0.137	0.187	-		
		B _Y		0.061	0.111	0.161	-		
	White	W _X		0.251	0.301	0.351	-		
		W _Y		0.281	0.331	0.381	-		

Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

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

For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON's BM-5 or BM-7 photo detector or compatible.

Note2. Definition of surface luminance.

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.

L_v = Average Surface Luminance with all white pixels($P_1, P_2, P_3, \dots, P_n$)

Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

$$YU = \frac{\text{Minimum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}{\text{Maximum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}$$

Note4. Definition of response time

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

fall time (T_f) is the time between photo detector output intensity changed from 10% to 90%.

For additional information see FIG1.

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity, The x,y value is determined by screen active area center position P5. For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. Angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope or DMS series Instruments or compatible.

FIG.1.The definition of response Time

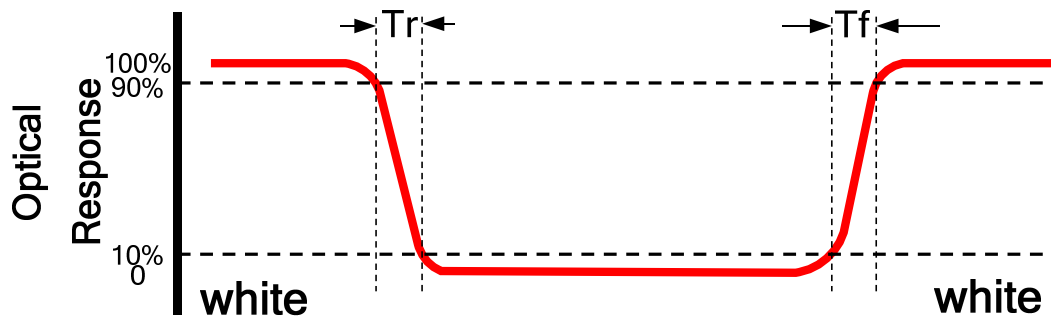


FIG.2. Measuring method for contrast ratio, surface luminance,

luminance uniformity, CIE (x,y) chromaticity

Size : $S \leq 5"$ (see Figure a) A : 5 mm B : 5 mm

H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-5 or

BM-7 or compatible (see Figure c).

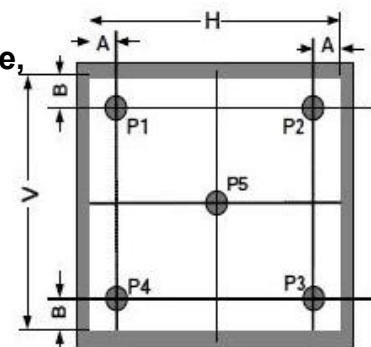


Figure a

Size : $5" < S \leq 12.3"$ (see Figure b) H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter BM-5 or

BM-7 or compatible (see Figure c).

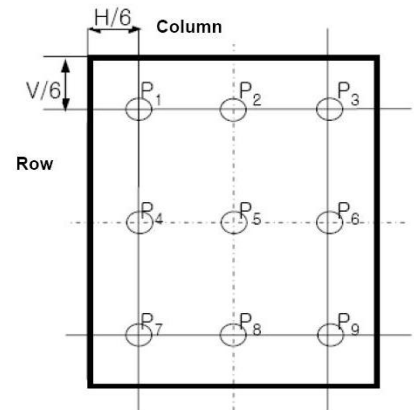


Figure b

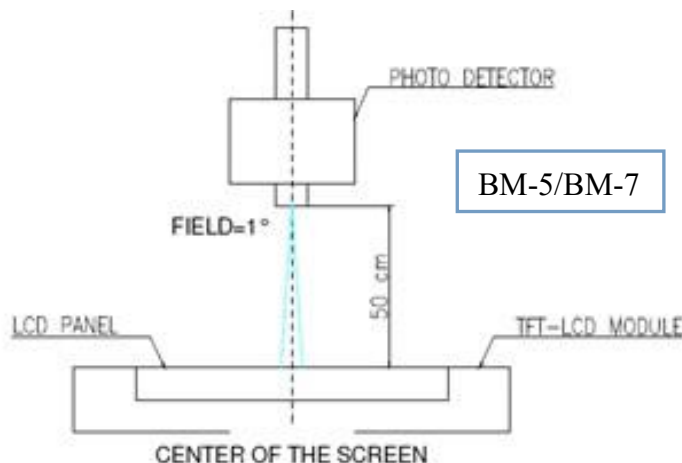
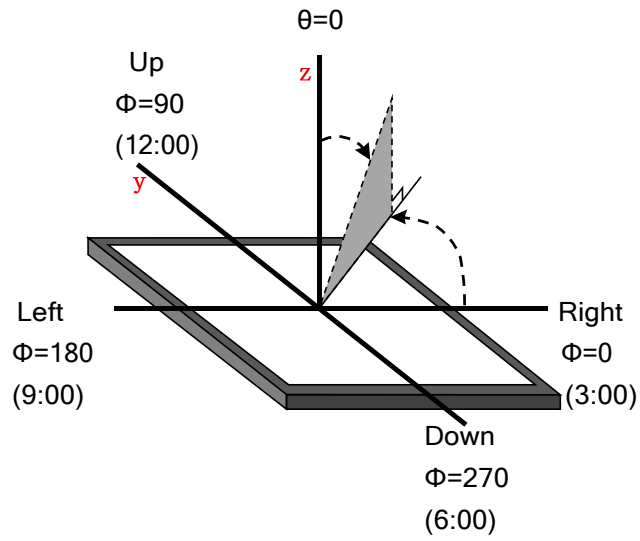


Figure c

FIG.3.The definition of viewing angle



8. Environmental / Reliability Tests

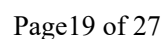
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +85°C, 96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -30°C, 96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +85°C, 96hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30°C, 96hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60°C, 90% RH max,96 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-20°C 30 min ~ +60°C 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	ElectroStatic Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15°C ~ 35°C, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. Ts is the temperature of panel's surface.

2. Ta is the ambient temperature of sample.

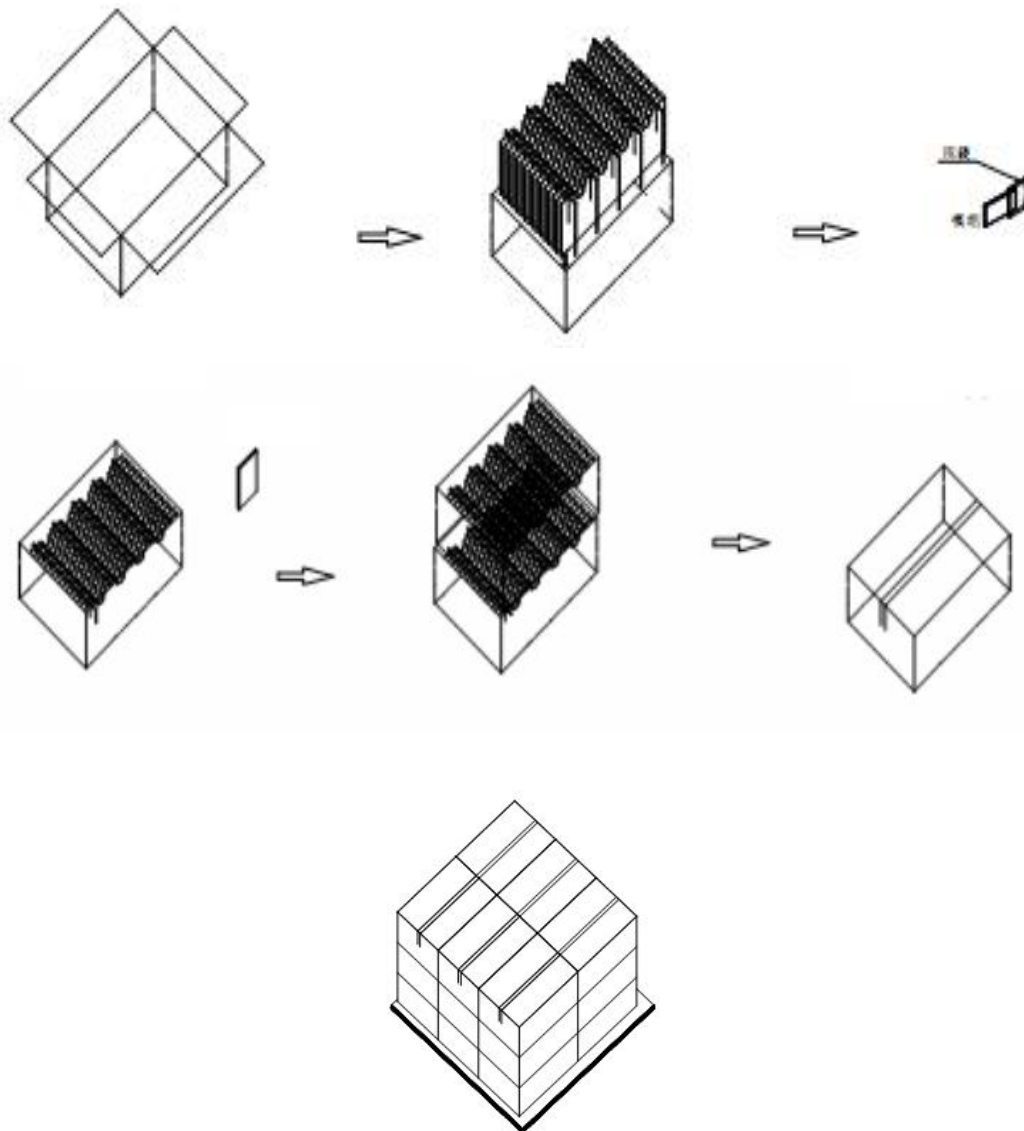
3. The size of sample is 5pcs.

9. Mechanical Drawing



10. Packing

Packing Method



Steps:

1. Put module into tray cavity
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above
4. Fix the cardboard to the tray stack with adhesive tape
5. Put the tray stack into carton
6. Carton sealing with adhesive tape

11. TFT-LCD Module Inspection Criteria

11.1 Objective

The TFT criteria is set to formalize the TFT quality standards with reference to customer for inspection.

11.2 Scope

The criteria is applicable to all TFT products (Include TFT , TFT+RTP or TFT+CTP) manufactured by TFC.

11.3 Tools for Inspection

Tester, calipers, multi-meter, anti-static wrist straps, finger cots, desk Lamps, etc.

11.4 Sampling Plan and Reference Standards

11.4.1 Sampling plan:

Refer to GB/T2828.1-2012/ISO2859-1:1999 //MIL-STD-105E

AQL: level II; normal:

1) MA=0.40

2) MI=0.65

11.4.2 IPC-A-610 Acceptability of Electronic Assemblies.

11.5 Inspection Conditions and Inspection Reference

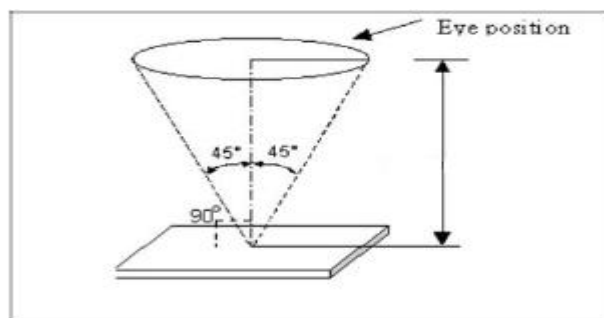
11.5.1 Cosmetic inspection with naked eyes:

1) Temperature: $23 \pm 5^{\circ}\text{C}$; relative humidity: 45~75%RH

2) Illumination: 500lux~1000lux

3) Distance: $30\text{cm} \pm 5$ from the inspector' s naked eyes to the LCD panel.

4) View angle: within 45° from perpendicular to LCM surface (view direction and special parameters refer to production specification).



11.5.2 Definition

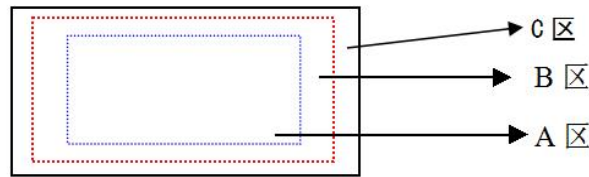
11.5.2.1 Area definition

A area: Active area (AA area)

B area: Viewing area (VA area)

C area: non-view area (out of B area)

11.5.2.2 Any cosmetic defect which do not affect product quality and customer assembling in C area, it's Acceptable. (The dimension is defined on the drawings)



11.5.2.3 Test condition: refer to product specification

11.5.3 Defect type:

11.5.3.1 A area defect type:

Line defect (scratch, soft flocks, fibre) 、 dot defect (white dot, black dot, same color dot, different color dot, bubble) , stain, pin-hole, light leak, scratch.

11.5.3.2 B area defect type:

Broken, crack/chipping, FPC defect

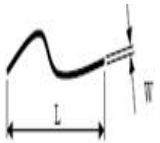
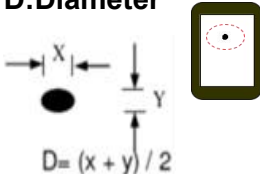
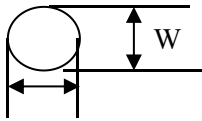
11.5.4 Undefined items or other special items, refer to mutual agreement and limited sample by customer.

11.5.5 Test condition: refer to product specification.

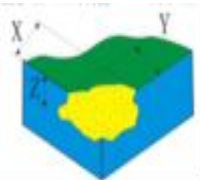
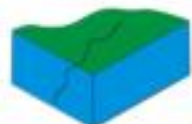
11.6 Defects and Acceptance Standards

11.6.1 Appearance inspection

11.6.1.1 Dot/line defect

Defect	S < 5"	Accepted standard	MAJ	MIN
S/C , line defect W:width L:length 	$W \leq 0.03\text{mm}$	Accept		√
	$0.03\text{mm} < W \leq 0.10\text{mm}$, $L \leq 5\text{mm}$ quantity ≤ 2 distance $> 10\text{mm}$	Accept		√
	$W > 0.10\text{mm}$ $L > 5\text{mm}$	Reject		√
Dot defect (black/white spot, foreign objects etc) D:Diameter 	$D \leq 0.10\text{mm}$	Accept		√
	$0.10\text{mm} < D \leq 0.25\text{mm}$ quantity ≤ 2 distance $> 10\text{mm}$	Accept		√
	$D > 0.25\text{mm}$	Reject		√
Polarizer with air bubble, convex-concave dots or dent defect  $d = (w+l)/2$	$D \leq 0.20\text{mm}$	Accept		√
	$0.20\text{mm} < D \leq 0.5\text{mm}$ quantity ≤ 2	Accept		√
	$d > 0.5\text{mm}$	Reject		√

11.6.1.2 Chip and Crack

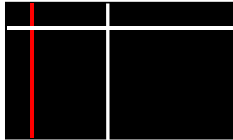
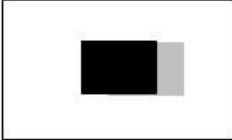
Defect	S < 5"	Accepted standard	MAJ	MIN
Chip 	$X \leq 0.3\text{mm}$, $Y \leq 0.3\text{mm}$, one side ≤ 1	Accept		√
	$X > 0.3\text{mm}$, $Y > 0.3\text{mm}$	Reject		√
Sensor chip	Not affect ITO line, not lengthen, function test is OK. And be non-visual after attaching Lens.	Accept		√
	Affect ITO line and be visual.	Reject		√
Glass crack 	Glass crack.	Reject		√

11.6.1.3 Attaching defect (kapton tape/protective film)

Defect	Description	Accepted standard	MAJ	MIN
High temperature kapton tape	Kapton tape attached on FPC doesn't meet the criterion of drawing.	Reject		√
Protective film	Clean、attaching flat、no shifting	Accept		√

11.6.2 TFT defects and Inspection Criterion

11.6.2.1 Function items

Defects	Inspection Criterion	Pictures	Inspection method/tools	Defect category
No display /function	shows no picture/display in normal connected situation. ->Rejected		Naked eyes/ testers	MA
Missing segment	Shows missing lines in normal display.->Rejected		Naked eyes/ testers	MA
Image retention (sticking)	The previous picture stays in the next picture. Disappear time <10s, OK; time>10s, NG		Naked eyes/ testers	MA
Flicker	Not accepted	/	Naked eyes/ testers	MA
Display abnormal	Not accepted		Naked eyes/ testers	MA
Display dim/bright	Refer to bright value definition	/	Naked eyes/ BM-7	MA
Contrast	Refer to SPEC	/	Naked eyes/ BM-7	MA
White/ black dot White/ black speckle	Refer to dot criterion	/	Naked eyes	MI

11.6.2.2 LCD pixel defect(defect category: MI)

Item	Accepted
Size	S <5"
Pixel defect (RGB dot)	1
2 connected bright pixel dot	0
3 connected bright pixel dot or more	0
Bright pixel dot quantity	1
Random dark pixel dot quantity	2
2 connected dark pixel dot	1
3 connected dark pixel dot or more	0
Dark pixel dot quantity	3
Multi-bright pixel dot	ND 5 % hidden, OK
<p>Remark: 2 bright pixel dots distance $DS \geq 15mm$ 2 dark pixel dots distance $DS \geq 5mm$</p> <p>1) Bright pixel dot: Power on TFT and RGB dot in black display</p> <p>2) Dark pixel dot: Power on TFT and gray or black dot in RGB display</p> <p>3) Multi-bright pixel dot: Power on TFT and fluorescent tiny dot in black display(only visible in black display)</p>	

11.7 Others

11.7.1 Some defect items are not defined in this document, obey to final agreement between customer and manufacturer or sign limit sample.

11. 7.2 If final goods include FPC/PCB, inspection criterion refers to IPC-610, Level 2.

12. Precautions for Use of LCD modules

12.1 Handling Precautions

12.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

12.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

12.1.6 Do not attempt to disassemble the LCD Module.

12.1.7 If the logic circuit power is off, do not apply the input signals.

12.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

12.1.8.1 Be sure to ground the body when handling the LCD Modules.

12.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

12.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

12.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

12.2 Storage Precautions

12.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

12.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

12.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.