



ASI-T-500MA5F6/W

No	Item	Specification	Remark
1	Type	Transmissive	--
2	Display Mode	Normally Black	--
3	Pixel Element	a-Si TFT	--
4	Screen Size	5.0 inch	--
5	Resolution	800(RGB) x 480	--
6	Color Number	16.7M	
7	Active Area	108.0 (W) x 64.8(L) (mm)	--
8	Pixel Size	0.135 x 0.135 (mm)	--
9	Color Arrangement	RGB-stripe	--
10	Assembly Type	COG	--
11	Back Light	LED	--
12	Viewing Direction	Free	--
13	Weight	TBD	g
14	Touch Panel Mode	FIVE fingers detection and Touch	--
15	Module Dimension	131.2(W) x 89.0(L) x 5.3(H) (mm)	--

3. General specifications

3.1 General specifications

It is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses the amorphous silicon TFT as a switching devices. This model is composed of a Transmissive type TFT-LCD Panel, a driver circuit and a back-light unit.

3.2 Features

- High image quality a-Si TFT LCD module.
- 16.7M color number.
- Support 24-bit parallel (RGB) input mode
- High contrast, high brightness
- Low power consumption.

4. Mechanical data

No	Item	Specification	Remark
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5. Absolute maximum ratings

5.1 Electrical absolute maximum ratings

(1) TFT-LCD Panel Absolute Maximum Ratings

Ta=25°C

Item	Symbol	Condition	Standard Value		Unit	Remark
			Min.	Max.		
Power Supply Voltage	VDD	GND=0V	-0.3	4.0	V	--

* If the LSI is used above these absolute maximum ratings, it may become permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are also exceeded, the LSI will malfunction and cause poor reliability.

(2) Back-Light Unit

Ta=25°C

Item	Symbol	Min.	Max.	Unit	Remark
Current	I _{LED}	--	90	mA	--

(3) Touch Panel Controller IC

Ta=25°C

Parameter	Symbol	Ratings (VSS=0V)	unit	Remarks
Supply voltage	V _{DD}	-0.3 ~ +6	V	--
Input voltage	V _{IN}	-0.3 ~ +6	V	--

5.2 Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	Unit	Remark
Operation temperature range	Top	-20	70	°C	Ambient
Storage temperature range	Tst	-30	80	°C	Ambient

- (1) Corrosive gas environment is not acceptable.
- (2) TFT-LCD color will change slightly depending on environment temperature.
This phenomenon is reversible.

6. Electrical characteristics

6.1 TFT-LCD Module

Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Voltage	VDD	3.1	3.3	3.6	V	--
Operating Current	IDD	--	53	--	mA	--
Hight Level Input Voltage	VIH	0.7VDD	--	VDD	V	NOTE (1)
Low Level input Voltage	VIL	GND	--	0.3VDD	V	

NOTE(1) : CLK , DE , R0~R7 , G0~G7 , B0~B7

6.2 Back-Light Unit

Ta=25°C

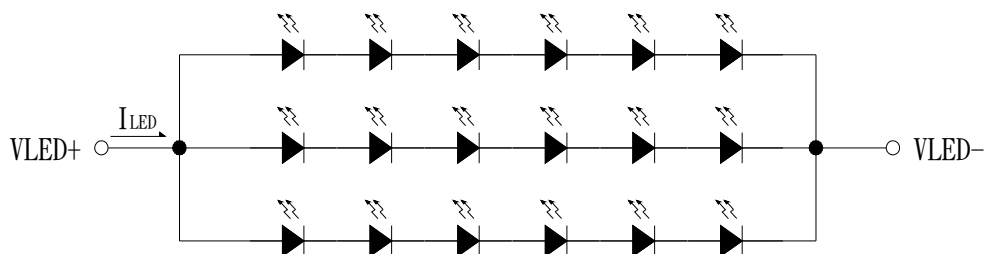
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Voltage	V _{LED}	16.2	18.0	19.2	V	NOTE (1)
Forward Current	I _{LED}	--	60	--	mA	--

NOTE (1) : The LEDs is serial type.

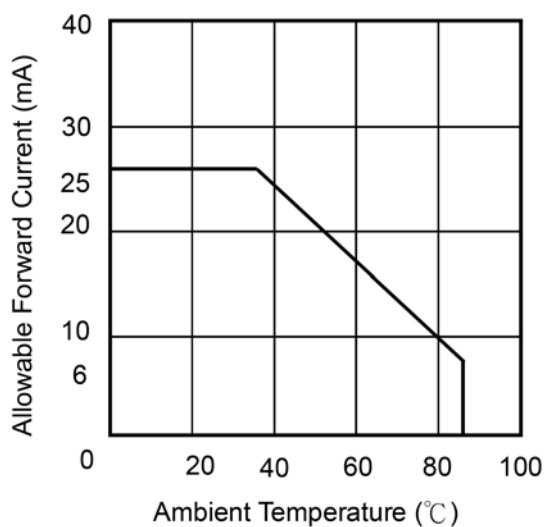
NOTE (2) : The “LED life time” is defined as the module brightness decreases to 50% of original brightness that the ambient temperature is 25°C and I_{LED}=60mA .

The LED lifetime could be decreased if operating I_{LED} is lager than 60mA.

NOTE (3) : Back-light circuit :



NOTE (4) : Current reduction rate of LED backlight is according to the graph indicated below :



6.3 Touch Panel Controller IC

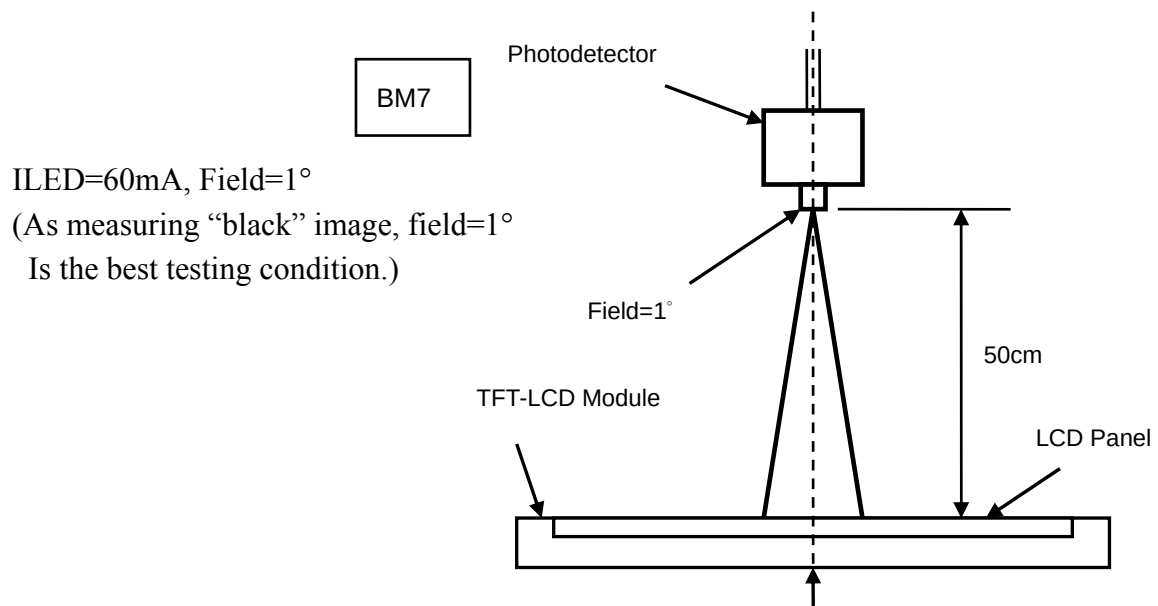
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply	VDD	2.7	3.3	3.5	V	--
Low Power Reset	VLVR	--	--	2.3	V	--

7. Optical characteristics

$T_a=25^{\circ}\text{C}$, $I_{LED}=60\text{mA}$

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		B	$\theta=0^{\circ}$ Normal viewing angle At the center of panel	500	550	--	cd/m^2	(1)
Contrast Ratio		C/R		800	1000	--	--	(2)
Response Time		Tr + Tf		--	30	40	ms	(3)
Color Gamut		(%)		45	50		%	
Color chromaticity	White	Wy		(0.295)	(0.345)	(0.395)	--	--
		Rx		(0.579)	(0.629)	(0.679)	--	--
	Red	Ry		(0.276)	(0.326)	(0.376)	--	--
		Gx		(0.287)	(0.337)	(0.387)	--	--
	Green	Gy		(0.496)	(0.546)	(0.596)	--	--
		Bx		(0.086)	(0.136)	(0.186)	--	--
	Blue	Wx		(0.270)	(0.320)	(0.370)	--	--
		By		(0.093)	(0.143)	(0.193)	--	--
Viewing Angle	Top	θ_U	$C/R \geq 10$ Backlight On	70	80	--	deg.	(4)
	Bottom	θ_D		70	80	--		
	Left	θ_L		70	80	--		
	Right	θ_R		70	80	--		
Uniformity		Un	$\theta=0^{\circ}$ Normal viewing angle	70	--	--	%	(5)

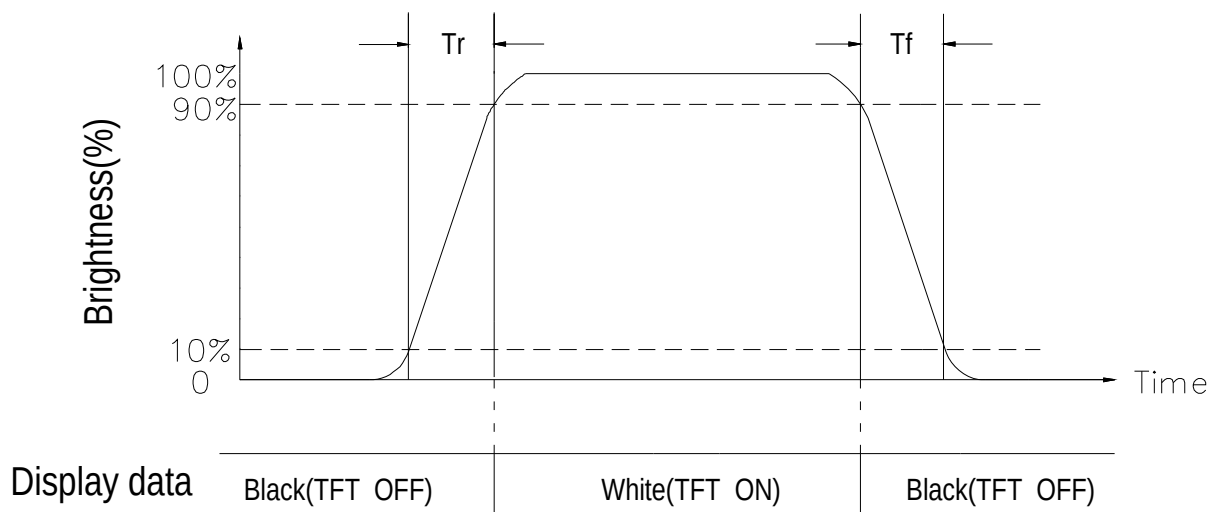
NOTE 1 : The brightness test equipment setup



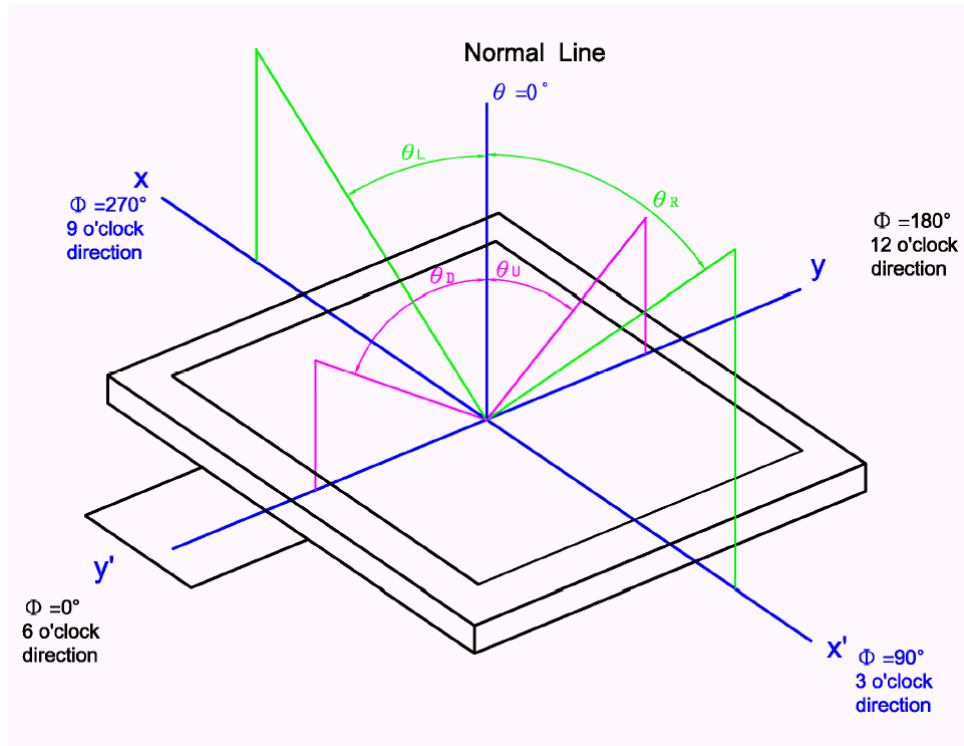
NOTE 2 : Definition of contrast Ratio (C/R)

$$C/R = \frac{\text{Brightness When LCD is at "White" State}}{\text{Brightness When LCD is at "Black" State}}$$

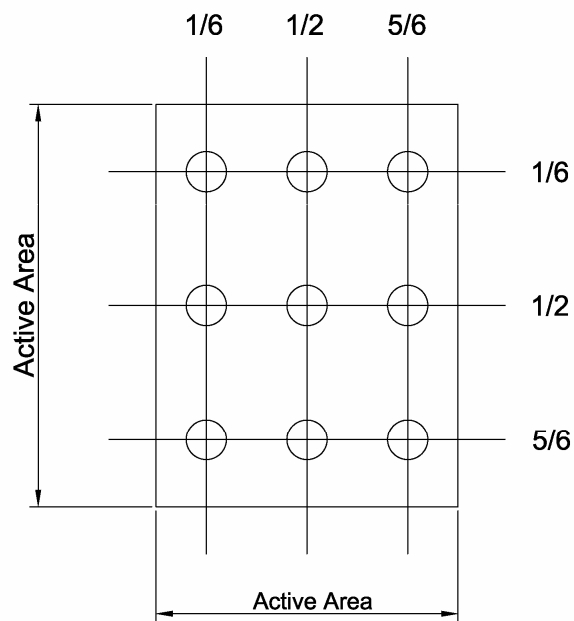
NOTE 3 : Definition of response time



NOTE 4 : Definition of viewing angle

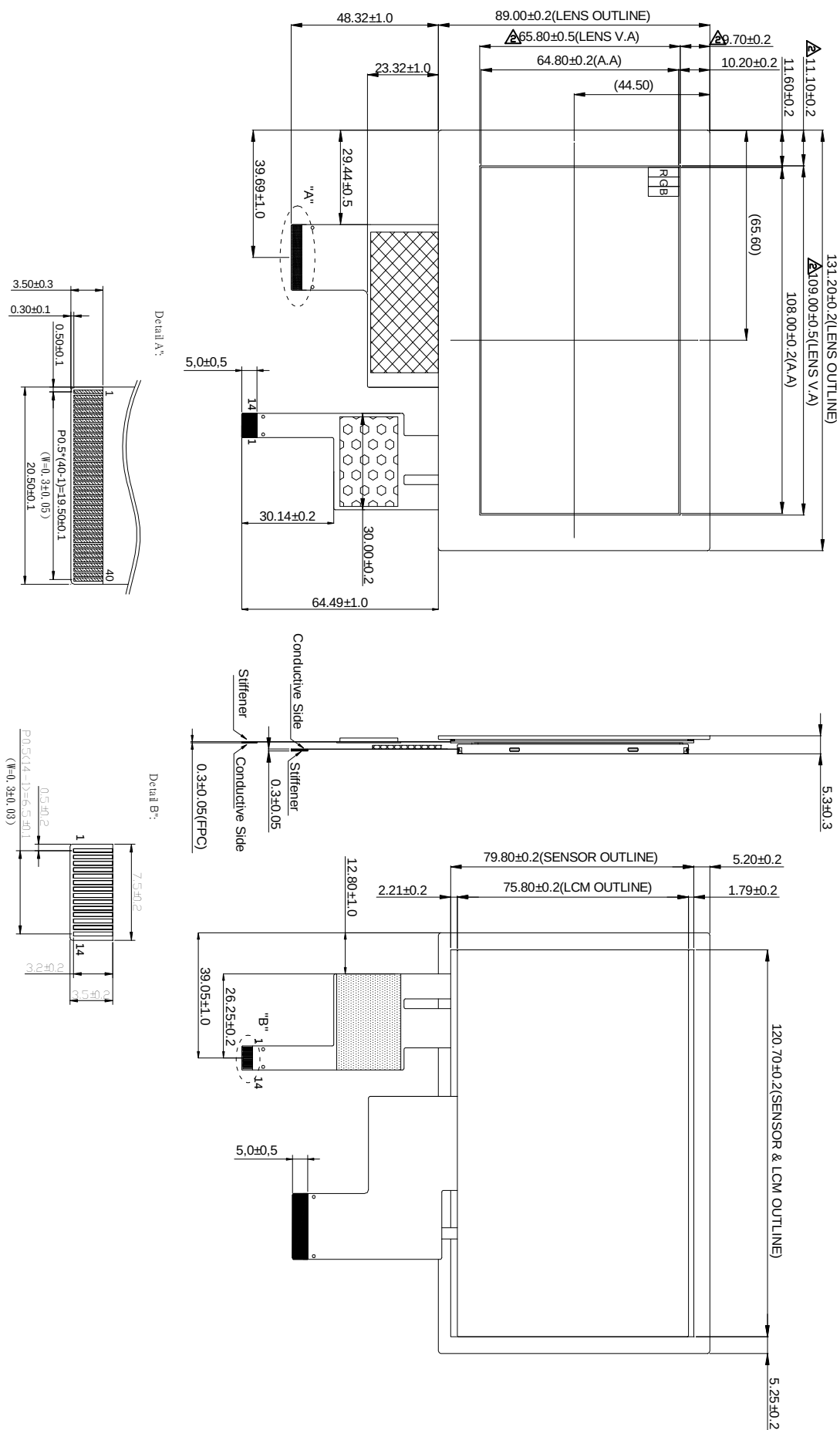


NOTE 5 : Definition of uniformity (Un)



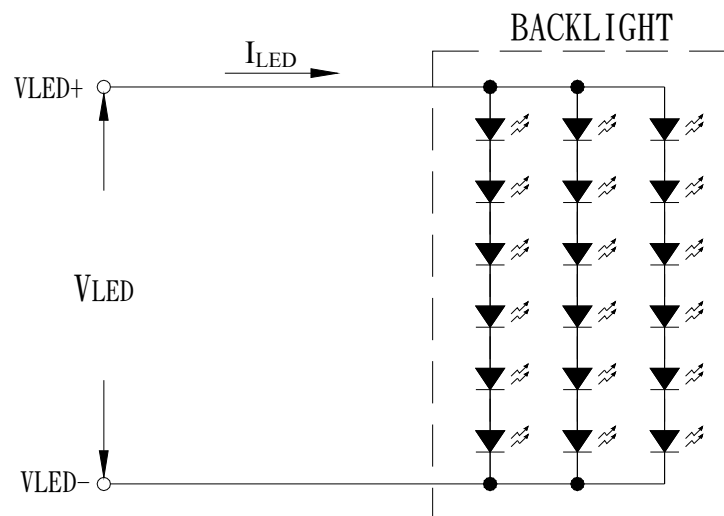
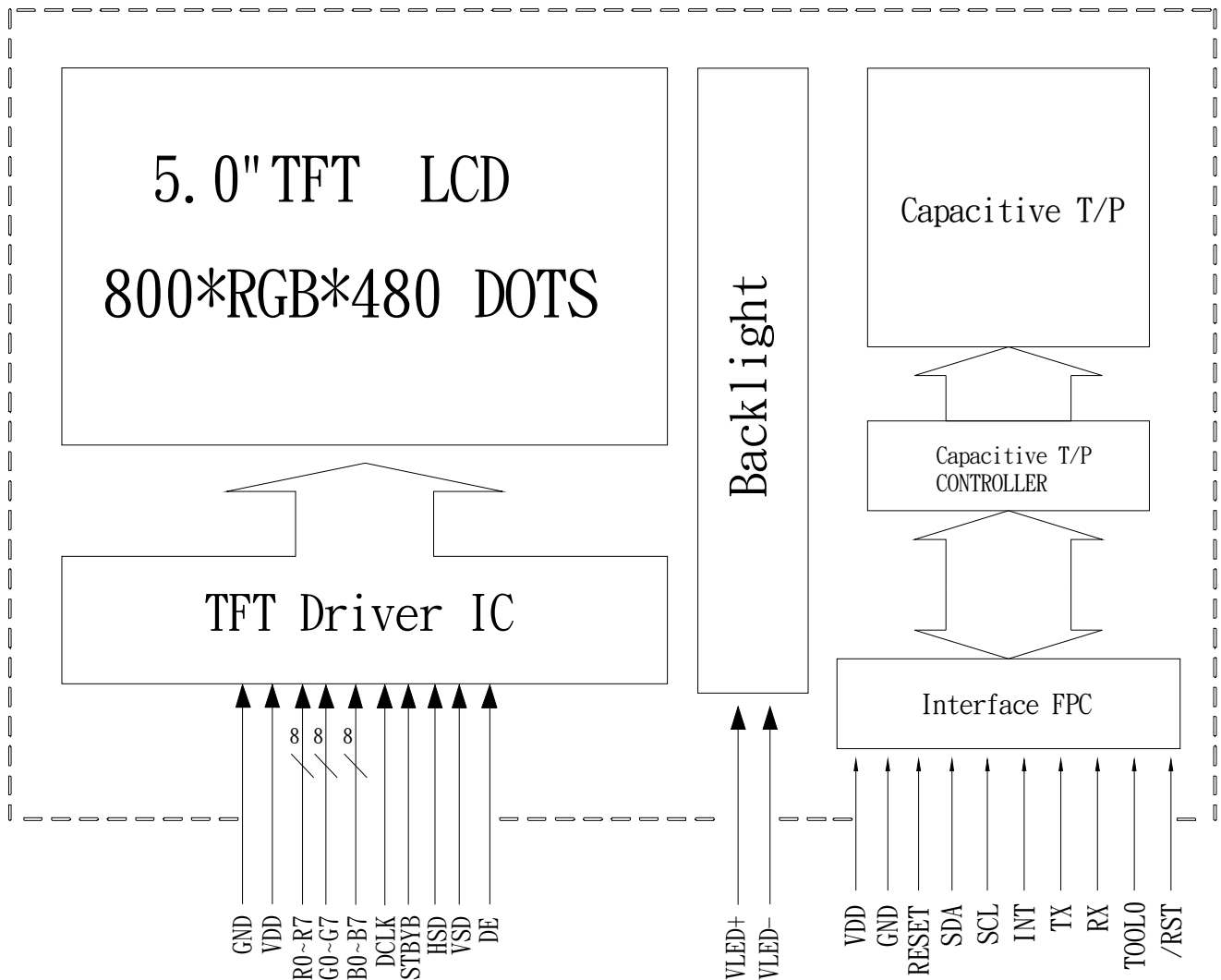
$$Un = \frac{B_{min}}{B_{max}} \times 100\%$$

8. Outline dimension



9. Block diagram

9.1 TFT-LCD Module (Interface System Structure)



10. Input Terminal Pin Assignment

10.1 Input Signal & Power

Pin no	Symbol	Description	Remark
1	VLED-	LED Cathode	-
2	VLED+	LED Anode	-
3	GND	Ground pins	-
4	VDD	Power supply for digital circuits	-
5	R0	Red data bit 0	-
6	R1	Red data bit 1	-
7	R2	Red data bit 2	-
8	R3	Red data bit 3	-
9	R4	Red data bit 4	-
10	R5	Red data bit 5	-
11	R6	Red data bit 6	-
12	R7	Red data bit 7	-
13	G0	Green data bit 0	-
14	G1	Green data bit 1	-
15	G2	Green data bit 2	-
16	G3	Green data bit 3	-
17	G4	Green data bit 4	-
18	G5	Green data bit 5	-
19	G6	Green data bit 6	-
20	G7	Green data bit 7	-
21	B0	Blue data bit 0	-
22	B1	Blue data bit 1	-
23	B2	Blue data bit 2	-
24	B3	Blue data bit 3	-
25	B4	Blue data bit 4	-
26	B5	Blue data bit 5	-
27	B6	Blue data bit 6	-
28	B7	Blue data bit 7	-
29	GND	Ground pins	-
30	DCLK	Clock signal for data latching and internal counter of	-
31	STBYB	Standby mode control. STBYB="L", enter standby mode for power saving. Timing controller and source driver will turn off, all outputs are Hi-Z.	-
32	HSD	Horizontal sync input	-
33	VSD	Vertical sync input	-
34	DE	Data Enable Control	-
35	NC	Not connection	-
36	GND	Ground pins	-

Pin no	Symbol	Description	Remark
37	NC(XR)	Not connection, Reserve for RTP	-
38	NC(YD)	Not connection, Reserve for RTP	-
39	NC(XL)	Not connection, Reserve for RTP	-
40	NC(YU)	Not connection, Reserve for RTP	-

11. Timing Characteristics

11.1 AC Characteristics

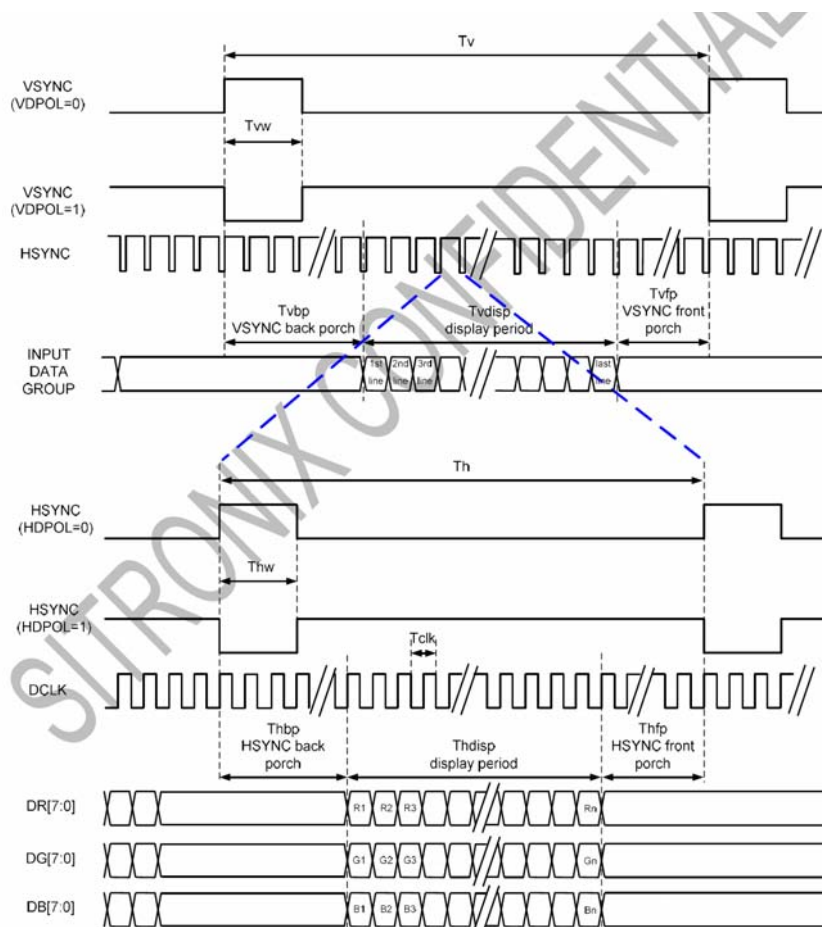
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD Power Source Slew Time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB Pulse Width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
SD Output Stable Time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD Output Rise and Fall Time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF

11.2 RGB Interface

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

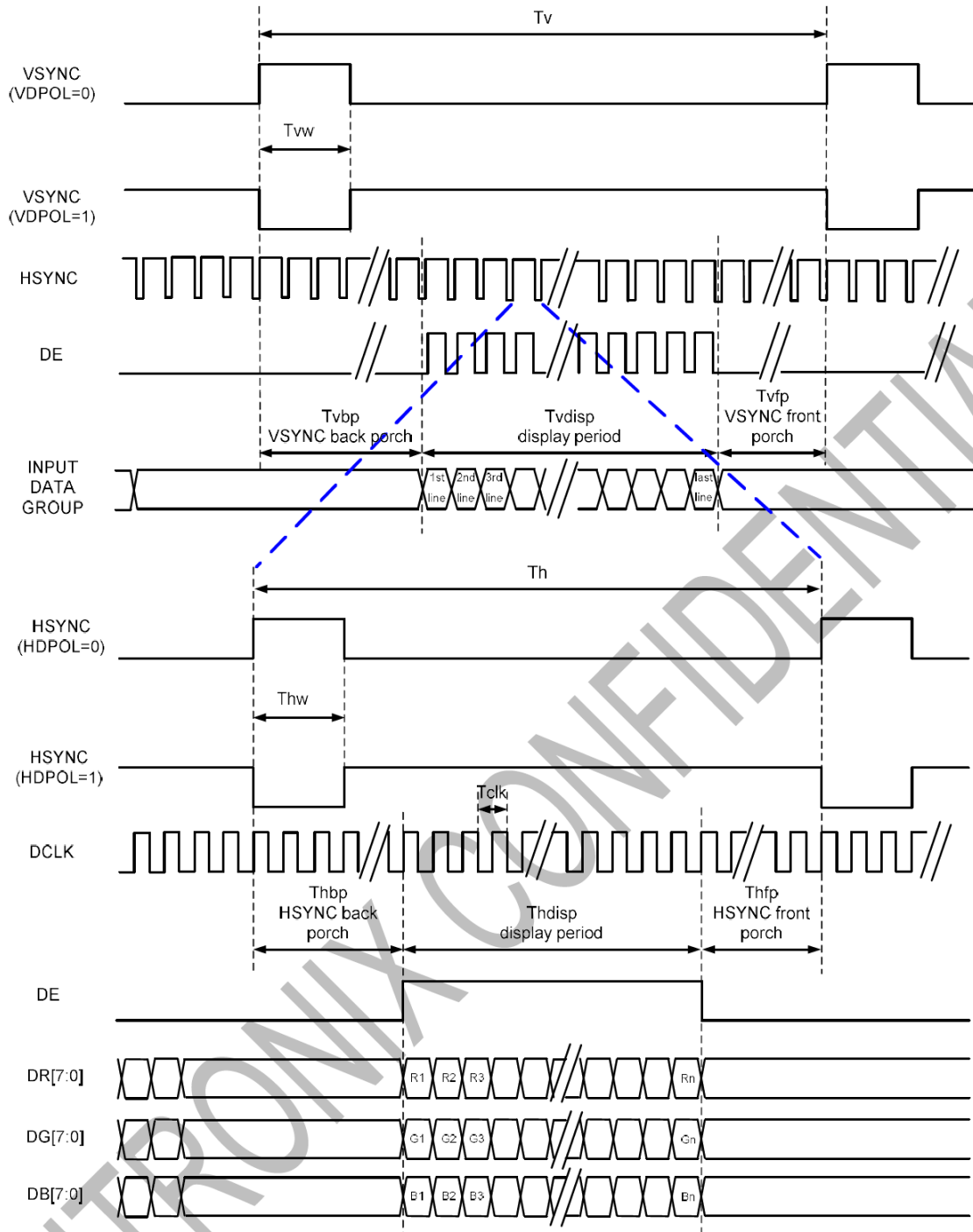
Note: "Input" means these signals are driven by host side

11.2.1 SYNC Mode



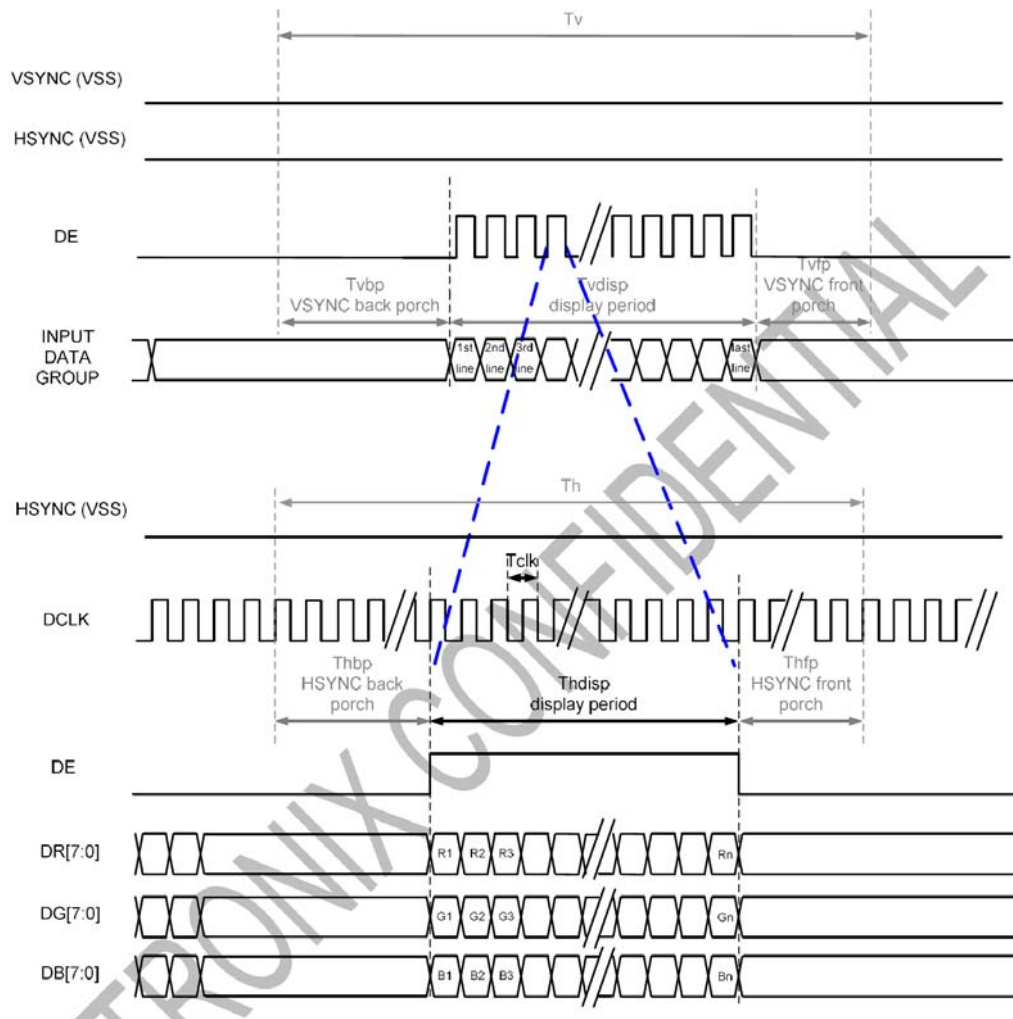
Note : LCM VDPOL=1,HDPOL=1.

11.2.2 SYNC-DE Mode



Note : LCM VDPOL=1,HDPOL=1.

11.2.3 DE Mode



11.2.4 Parallel 24-bit RGB Input Timing Table

Parallel 24-bit RGB Input Timing (PVDD=PVDD1=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

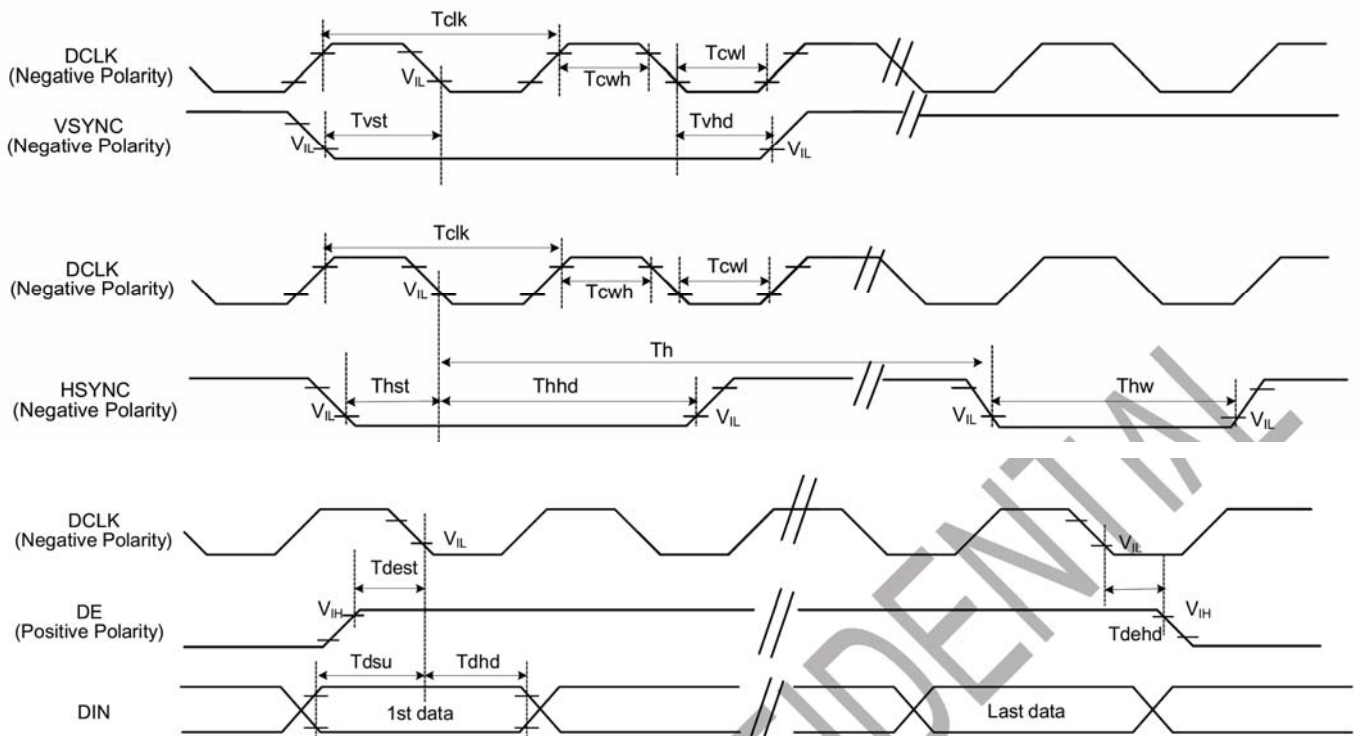
Parallel 24-bit RGB Interface Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	23	25	27	MHz	
HSYNC	Period Time	Th	808	816	896	DCLK
	Display Period	Thdisp	800			DCLK
	Back Porch	Thbp	4	8	48	DCLK
	Front Porch	Thfp	4	8	48	DCLK
	Pulse Width	Thw	2	4	8	DCLK
VSYNC	Period Time	Tv	492	496	504	HSYNC
	Display Period	Tvdisp	480			HSYNC
	Back Porch	Tvbp	6	8	12	HSYNC
	Front Porch	Tvfp	6	8	12	HSYNC
	Pulse Width	Tvw	2	4	8	HSYNC

Note: 1. The minimum blanking time depends on the GIP timing of the panel specification

2. To ensure the compatibility of different panels, it is recommended to use the typical setting.

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

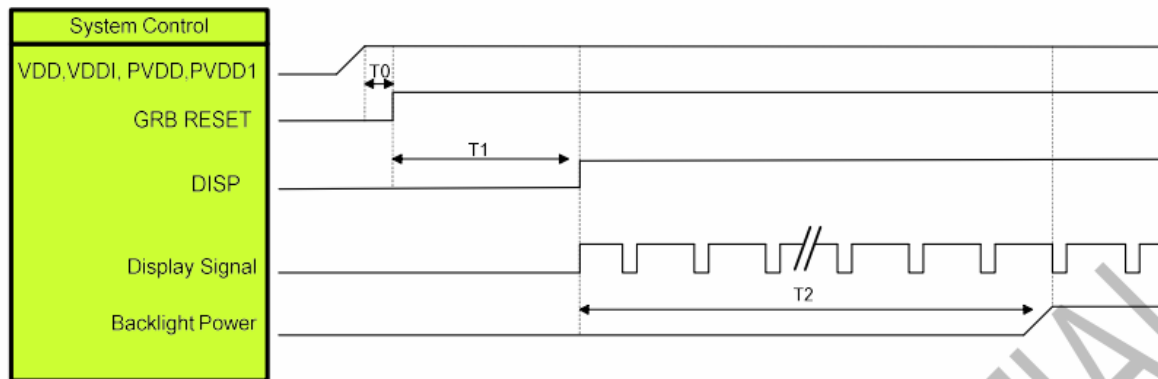
11.3 System Bus Timing for RGB Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tcw	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
HSYNC Period	Th	55	60	65	us	
VSYNC Setup Time	Tvst	10	-	-	ns	
VSYNC Hold Time	Tvhd	10	-	-	ns	
HSYNC Setup Time	Thst	10	-	-	ns	
HSYNC Hold Time	Thhd	10	-	-	ns	
Data Setup Time	Tdsu	10	-	-	ns	
Data Hold Time	Tdhd	10	-	-	ns	
DE Setup Time	Tdest	10	-	-	ns	
DE Hold Time	Tdehd	10	-	-	ns	

11.4 Power On/Off Sequence

Power On Sequence

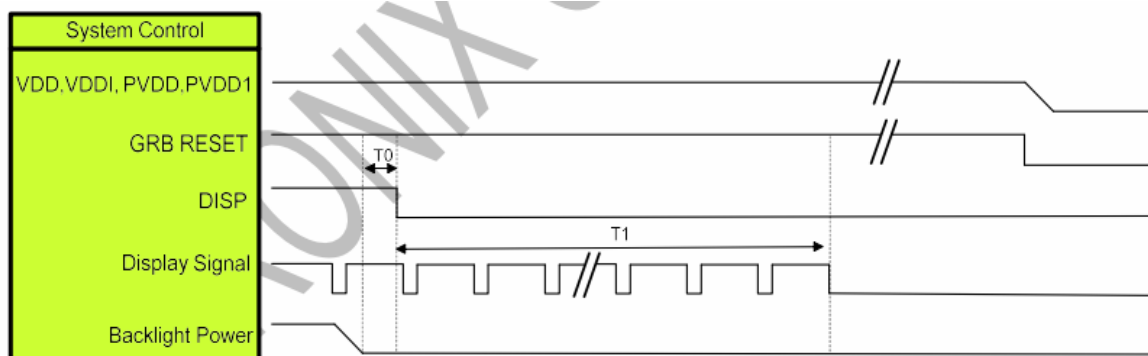


Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note :

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]
3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N

Power Off Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	100	ms

Note :

1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures. Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]
3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N

12. Driver IC Control Algorithms

1.Refer to the data Sheet of LCD DRIVER IC1 ST7262 or equivalent.

13. Capacitive touch panel programming guide

△ 13.1 Communication Interface (CN2)

Pin	Symbol	I/O	Description	Remark
1	Shielding_GND	--	Shielding Ground	--
2	NC	--	No Connection	--
3	VDD	I	Power supply (+3.3V)	--
4	SCL	I	I2C Serial clock	--
5	SDA	I/O	I2C Serial data	--
6	INT	I	Indicate coordinate data ready	--
7	RESET	I	System reset signal input, active low(I ² C)	--
8	GND	I	Ground	--
9	TX	O	UART data transmit	--
10	RX	I	UART data receive	--
11	TOOL0	I	Programming Pin	--
12	/RST	I	System reset signal input, active low(UART)	--
13	NC	--	No Connection	--
14	Shielding_GND	--	Shielding Ground	--

※I2C Slave address is 0x55(7-bits address) for Touch IC.

13.2 Command Table

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x12	XY0 Coord. (High Byte)	X0_H (RO)			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)			Y1_H (RO)			
0x17	X1 Coord. (Low Byte)	X1_L (RO)							
0x18	Y1 Coord. (Low Byte)	Y1_L (RO)							
0x19	...	Reserved.							
0x1A	...	...							
...	...	...							
0x25	...	...							

14. Reliability Test Items

No.	Test items	Conditions	Remark
1	High temperature operation	70℃ , 240hours	
2	Low temperature operation	-20℃ , 240hours	
3	High temperature storage	80℃ , 240hours	
4	Low temperature storage	-30℃ , 240hours	
5	High temperature & high humidity storage	40℃ , 90% RH , 120hours	
6	Thermal Shock storage	-20℃ , 30min. ~ 70℃ , 30min. , 100 Cycles	--
7	Vibration test	Freq.:10~55~10~55~10 Hz, Amplitude : 1.5 mm. 2 hours for each direction of X, Y, Z	Non-operation
8	Electrostatic discharge	±2KV, Human Body Mode, 100pF / 1500Ω	Non-operation
Criterion: There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.			

15. General Precautions

Please pay attentions to the followings as using the LCD module.

15.1 Handling

- (a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- (b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- (c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- (d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.
- (e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the polarizer permanently. The recommended solvents are water and Isopropyl alcohol.
- (f) Wipe off water droplets or oil immediately.
- (g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (h) Do not touch the output pins directly with bare hands.
- (i) Do not disassemble the LCD module.

15.2 Storage

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.
- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

15.3 Operation

- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms should always obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.

- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

15.4 Others

- (a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- (b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.
- (c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

16. Quality and reliability

16.1 Test condition

Test should be conducted under the following conditions:

- (a) Ambient temperature: $25 \pm 5^{\circ}\text{C}$
- (b) Humidity: $55 \pm 10\% \text{ RH}$

16.2 Sampling plan

Sampling method shall be in accordance with MIL-STD-105D, inspection level II, normal inspection, and single sampling plan tables for normal tightened and reduced inspection.

16.3 Acceptable quality level

A major defect is a defect that could result in failure or materially reduce that the usability of the unit of product for its intended purpose.

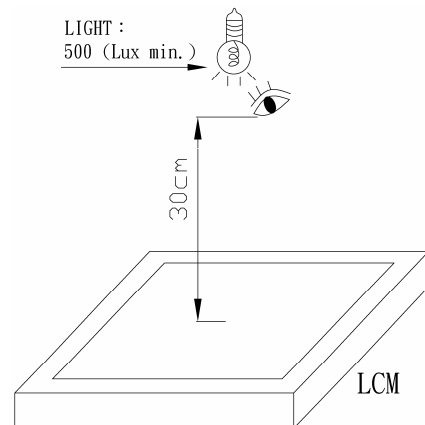
A minor defect is one that does not materially reduce the usability of the unit of product for its intended purpose or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

16.4 Appearance

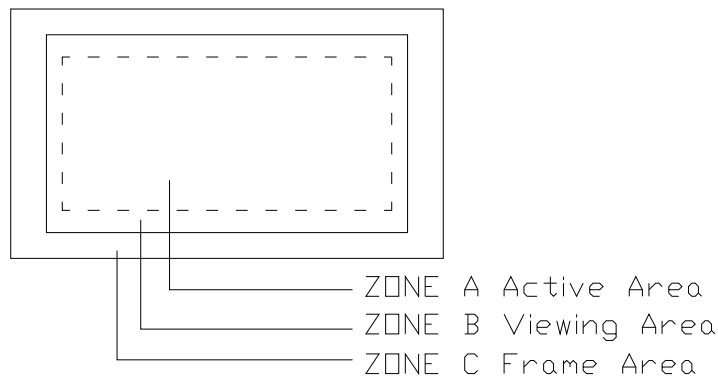
Appearance test is to be conducted by human eyes at approximately 30cm distance from LCD module under the single fluorescent light without reflection.

Condition:

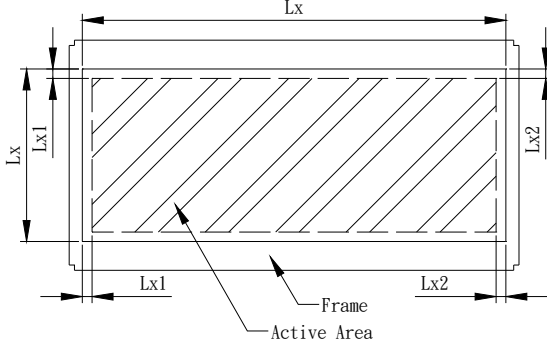
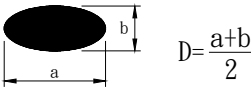
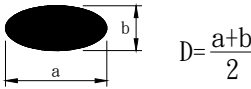
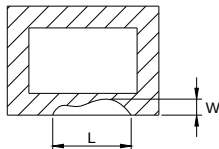
- (a) Illumination: 500 Lux min
- (b) Inspect determination: 30cm
- (c) Inspect direction: above the LCM
- (d) View angle: $\pm 30^{\circ}$



The inspection area of LCD panel shall be within the range of following limits.



16.5 Inspection quality criteria for TFT LCM

ITEM	DESCRIPTION OF DEFECTS			Zone	Acceptable level (%)
DIMENSION	Refer to individual acceptance specification			ABC	2.5
SLANT	Viewing Area	Lx1-Lx2	Judgment	A	2.5
	$Lx \leq 100\text{mm}$	$\leq 0.2\text{mm}$	ACC		
	$100\text{mm} < Lx \leq 150\text{mm}$	$\leq 0.3\text{mm}$	ACC		
	$150\text{mm} < Lx \leq 200\text{mm}$	$\leq 0.4\text{mm}$	ACC		
	$200\text{mm} < Lx$	$\leq 0.5\text{mm}$	ACC		
					
LINE DEFECT ON SURFACE (SCRATCHES, BLACK/ WHITE LINE)	(a) $W \leq 0.03\text{mm}$, disregard (b) $L \leq 2\text{mm}$ & $0.03\text{mm} < W \leq 0.05\text{mm}$, $N \leq 1$ (c) $L > 2\text{mm}$ or $W > 0.05\text{mm}$, REJ (e) Distance between 2 lines $\geq 15\text{mm}$			A	2.5
SPOT DEFECT ON SURFACE (BLACK/ WHITE SPOT)	Average diameter, D (a) $D \leq 0.1\text{mm}$, disregard (b) $0.1\text{mm} < D \leq 0.2\text{mm}$, $N \leq 2$.ACC (c) $0.2\text{mm} < D \leq 0.25\text{mm}$, $N \leq 1$.ACC (d) $D > 0.25\text{mm}$, REJ (e) Distance between 2 spots $\geq 3.0\text{mm}$ 			A	2.5
PROTRUDE DOT/ DENT ON SURFACE	Average diameter D (a) $D \leq 0.2\text{mm}$, disregard (b) $0.2\text{mm} < D \leq 0.3\text{mm}$, $N \leq 2$.ACC (c) $0.3\text{mm} < D \leq 0.5\text{mm}$, $N \leq 1$.ACC (d) $D > 0.5\text{mm}$, REJ (e) Distance between 2 protrude dot/ dent $\geq 15\text{mm}$ 			A	2.5
POLARIZER EDGE	BUBBLES 、DENTS 、RESIDUAL GLUE 、DECKLE EDGE : Active Area outside area don't care.			A,B	2.5
DAMAGE	(a) Lead side of TFT LCM FPC lead electrical line can't be damage, except dummy electrical line and alignment mark.  (b) Non-lead side of TFT LCM Damage area $L \leq 2.5\text{mm}$, $W \leq 0.7\text{mm}$, ACC			A	0.65

NOTE(1): ACC : Accept

NOTE(2): REJ : Reject

ITEM	DESCRIPTION OF DEFECTS		Zone	Acceptable level (%)																					
BRIGHT/ DARK POINT	<table><tr><td colspan="2">Item</td><td>Allow number in Area A</td></tr><tr><td rowspan="4">(a) Bright point</td><td>Single point</td><td>2</td></tr><tr><td>Two adjacent point</td><td>0</td></tr><tr><td>Three adjacent point</td><td>0</td></tr><tr><td>Total point</td><td>2</td></tr><tr><td rowspan="4">(b) Dark point</td><td>Single point</td><td>3</td></tr><tr><td>Two adjacent point</td><td>0</td></tr><tr><td>Three adjacent point</td><td>0</td></tr><tr><td>Total point</td><td>3</td></tr></table>		Item		Allow number in Area A	(a) Bright point	Single point	2	Two adjacent point	0	Three adjacent point	0	Total point	2	(b) Dark point	Single point	3	Two adjacent point	0	Three adjacent point	0	Total point	3	A	2.5
	Item		Allow number in Area A																						
	(a) Bright point	Single point	2																						
		Two adjacent point	0																						
		Three adjacent point	0																						
		Total point	2																						
	(b) Dark point	Single point	3																						
		Two adjacent point	0																						
		Three adjacent point	0																						
		Total point	3																						
	※ Point : A sub pixel 1R or 1G or 1B																								
	※ The distance of bright or dark point > 5mm																								
CHROMA MURA		A	2.5																						
COLOR NOT ACCORD		A	2.5																						
DISPLAY ABNORMAL		A	0.65																						

NOTE(1): ACC : Accept

NOTE(2): REJ : Reject