TFT Product Specification

◇   PRELIMINARY SPECIFICATION

◆   APPROVED SPECIFICATION

Part Number: FLC-050DMTM000SA1

Description : TFT 5''W, 800(H)*480(V), Full Viewing Angle, TTL , 900CD

Prepared by: Natalie

Approved by: David

Version: V4.0

	Prepared by	Reviewed by	Date
	Natalie Lin	David	2020/02/10

Revision History

Version	Date	Page	Description	Note
V1.0	2019/9/24		Preliminary	
V2.0	2019/9/28		Modify drawing	P19/20
V3.0	2019/9/29		Add details pinout	
V4.0	2020/02/10		1. Modify the brightness	P4/15
			2. Modify the operating/storage temperature	P5

Table of Content

1. GENERAL DESCRIPTION

1.1 Description

5 inch is a Color Active Matrix Liquid Crystal Display Module composed of a TFT LCD panel and LED backlight system. The screen format is intended to support the 800(H) x480(V) screen and 16.7M colors.

1.2 Product Summary

The following items are summary on the table under Ta=25 °C condition:

No.	Item	Specification	Unit
1	Display Size	5.0	Inch
2	Pixel Number	800(H) x (R,G,B) x 480(V)	Pixels
3	Outline Dimension	120.7(H) x 75.8(V) x 3.1(D)	mm
4	Active Area	108 (H) x 64.8 (V)	mm
5	Pixel Pitch	0.135(H) x 0.135(V)	mm
6	Display Colors	16.7M	- -
7	Display Format	RGB vertical stripe	- -
8	Display Mode	Normally Black	- -
9	Electrical Interface	TTL	
10	Surface Treatment	Antiglare, Hard-Coating (3H)	- -
11	Brightness	900 (central) (Typ)	cd/m2
12	Contrast Ratio	1000 (Typ.)	- -
13	Consumption of Power	LCD Module: 0.79W (Max) Backlight: 1.2 (Max.)	W
14	Module Weight	66 (Typ)	g

2. ABSOLUTE MAXIMUM RATING

2.1 Electrical Absolute Rating

Item	Symbol	Values		Unit	Remark
		Min	Max		
LCD Power Voltage	V_{DD}	-0.3	5.0	V	GND=0
	V_{GH}	0.3	40	V	GND=0
	V_{GL}	-20	0.3	V	GND=0
	AV_{DD}	0.5	15	V	AGND=0
	V_{COM}	0	6	V	
Logic Signal Input Level	V_I	-0.3	VDD+0.3	V	

Note 1. Permanent damage may occur to the LCD module if beyond this specification.

Functional operation should be restricted to the conditions described under normal operating conditions.

Note 2. Ta= 25±2℃

2.2 Backlight Unit

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Forward Voltage	Vf	--	19.2	21.0	V	Note(1)(2)(3)
Forward Current	If	--	60		mA	Note(1)(2)(3)
Power Consumption	PBL	--	1152		mW	

Note(1): Permanent damage may occur to the LCD module if beyond this specification.

Functional operation should be restricted to the conditions described under normal operating conditions.

Note(2): Ta =25±2℃

Note(3): Test Condition: LED current 40 mA

2.3 Environment Absolute Rating

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Operating Temperature	Top	-30	80	°C	
Storage Temperature	Tstg	-30	80	°C	

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Supply voltage	V_{DD}	3.0	3.3	3.6	V	
Input signal voltage	V_{IH}	0.7*VDD	-	VDD	V	Note(1)
	V_{IL}	GND	-	0.3*VDD	V	Note(1)(3)
Current of power supply	I_{DD}	-	-	220	mA	VDD=3.3V

Note (1): HSYNC, VSYNC, DE, Digital Data
Note (2): Be sure to apply the power voltage as the power sequence spec.
Note (3): GND=AGND=0V

3.2 Backlight Unit

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Current	IL	-	60	-	mA	Note(2)
LED Voltage	VL	-	19.8	21.0	V	
Operating LED life time	Hr	50000			Hour	Note(1)(2)

Note(1): LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 ℃, 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 Ta=25℃ and IL=40mA.

The LED lifetime could be decreased if operating IL is larger than 40mA.

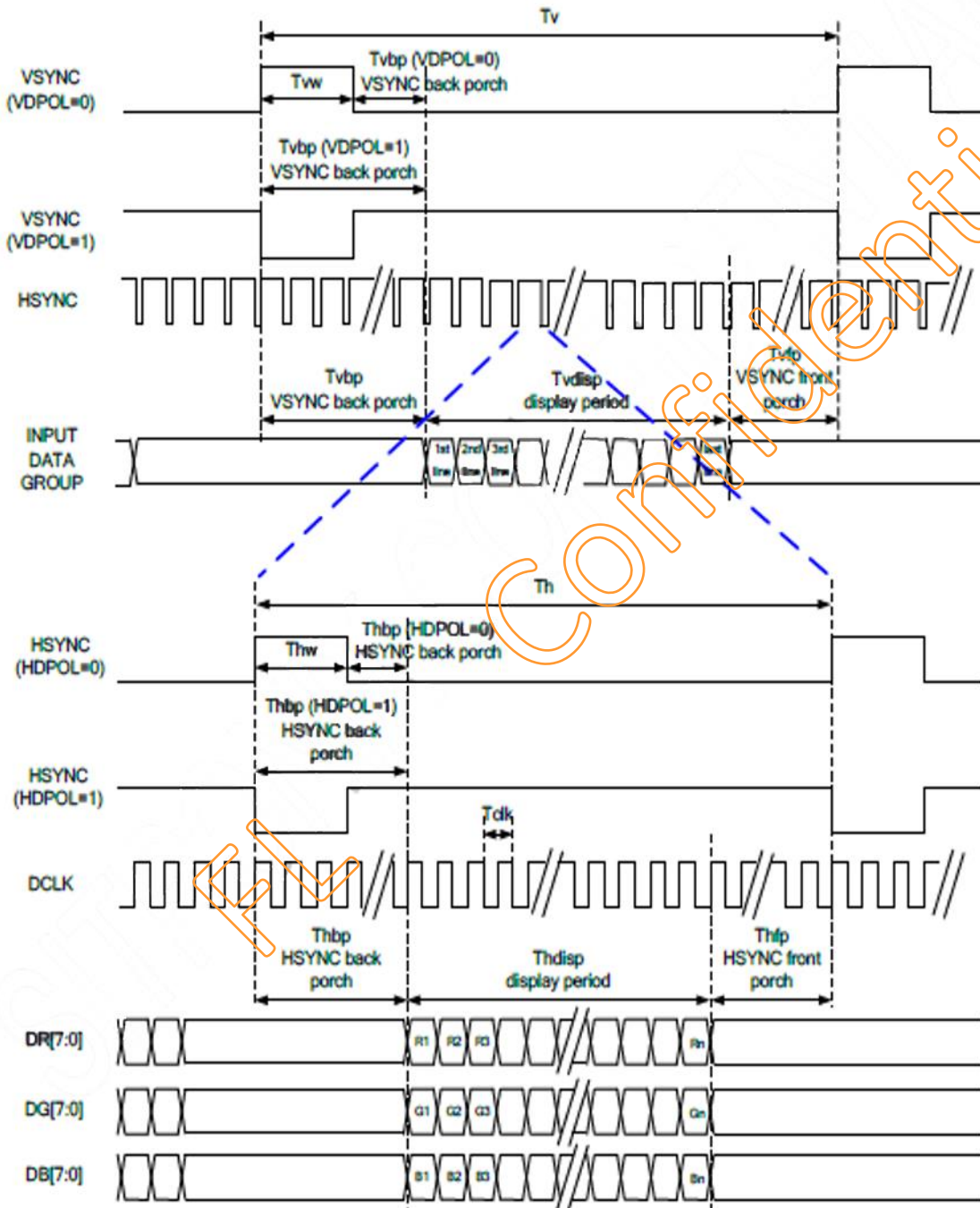The constant current driving method is suggested.
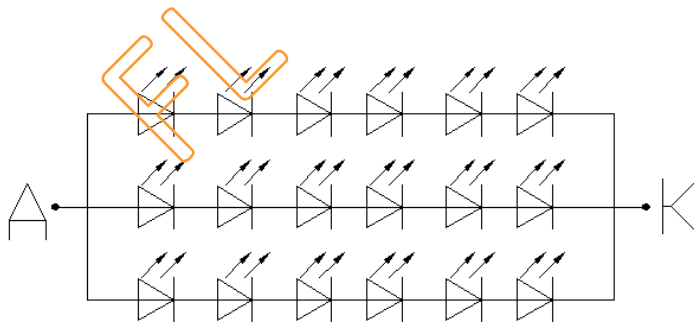
4. AC Characteristics

4.1 RGB Interface

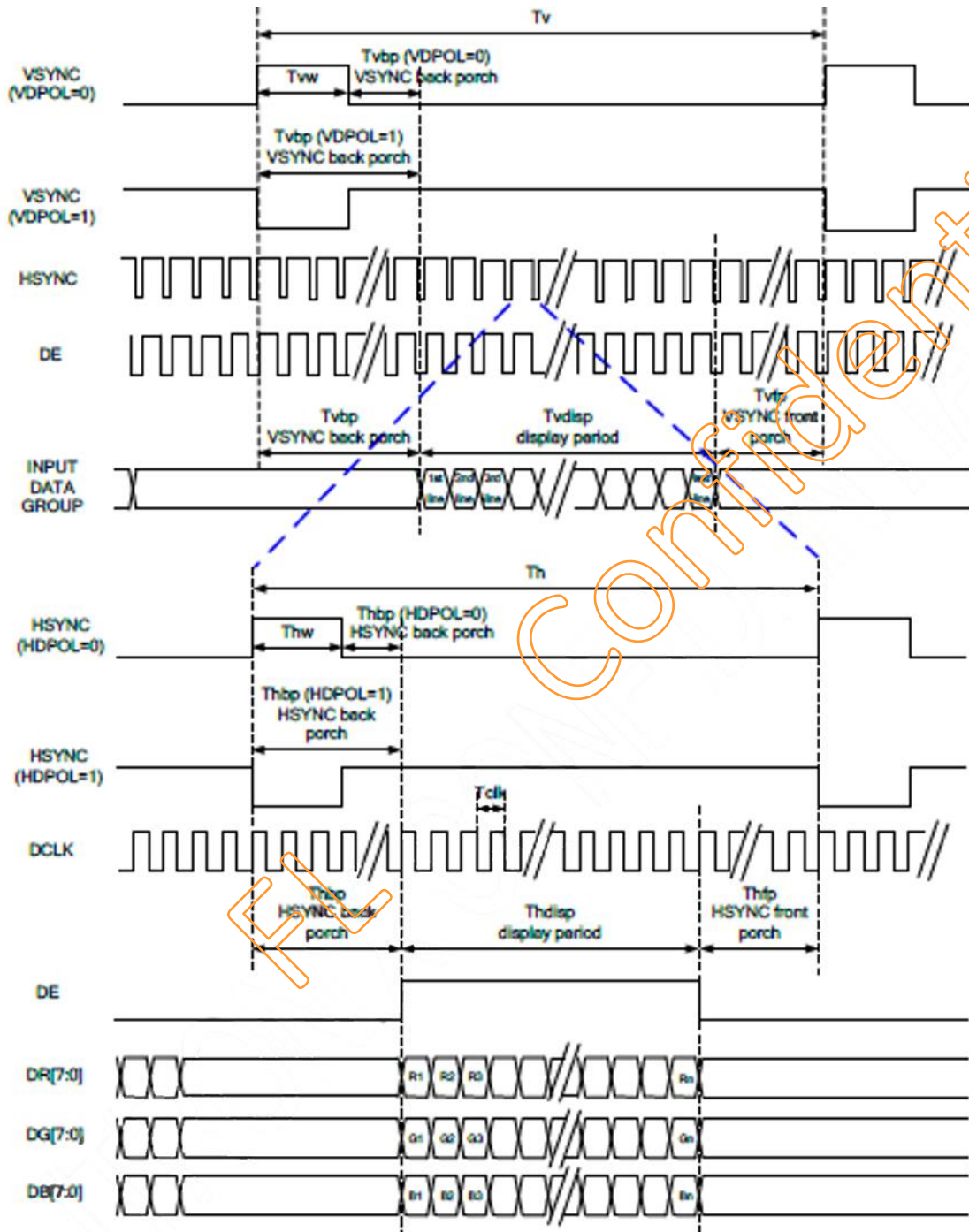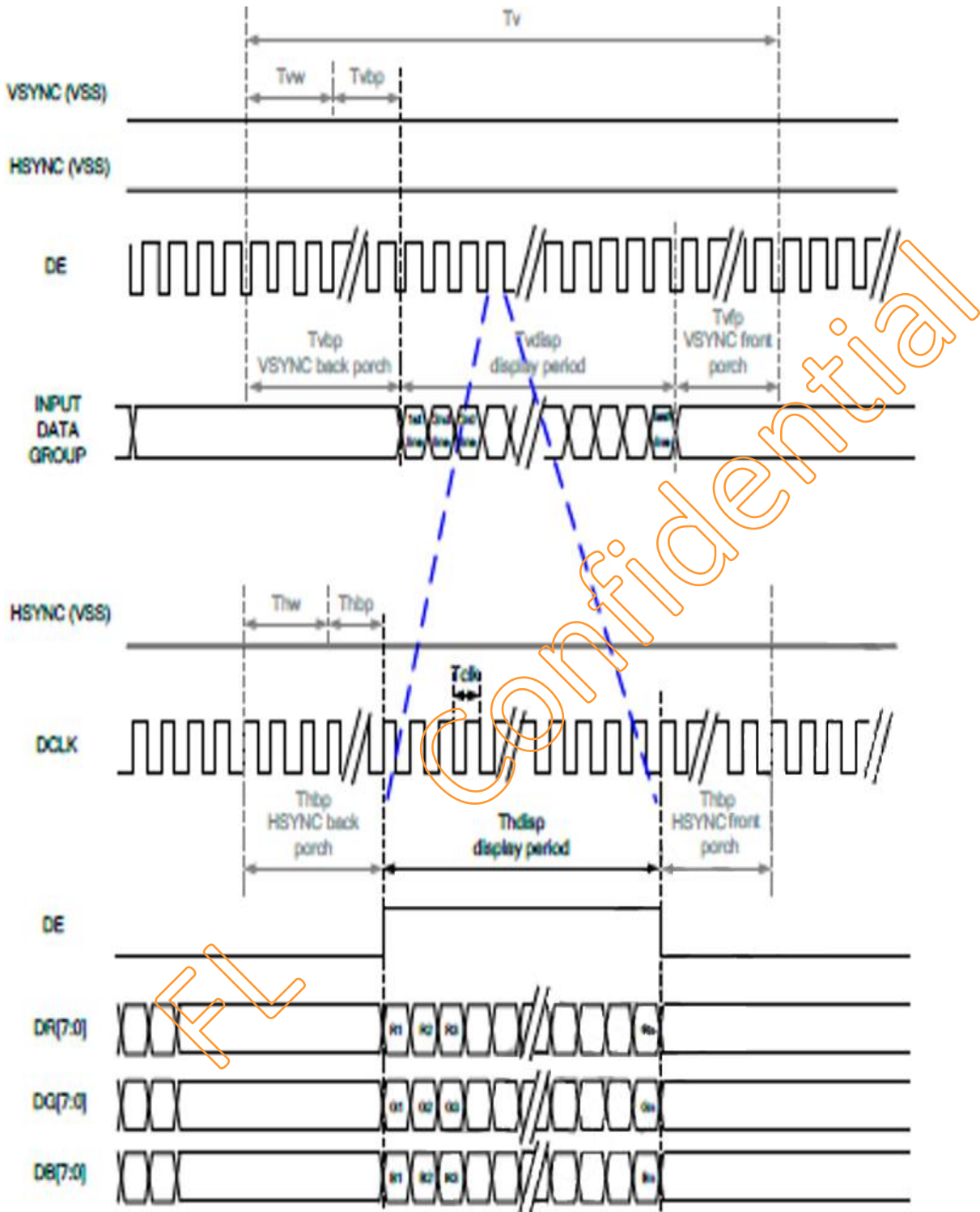| RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC – DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

4.2 SYNC mode

4.2.1 SYNC Mode

4.2.2 DE Mode

4.2 Timing Chart

Parallel 24-bit RGB input Timing (PVDD=VDD=VDDI=3.3V AGND=0V ,TA=25℃

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	818	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 Tvdisp	488	496	504	HSYNC	
	Display Period	Tvdisp		480		HSYNC	
	Back Porch	Tvbp	4	8	12		
	Front Porch	Tvfp	4	8	12	HSYNC	
	Pulse Width	Tvw	2	4	8	HSYNC	

4.2.2 Power Sequence

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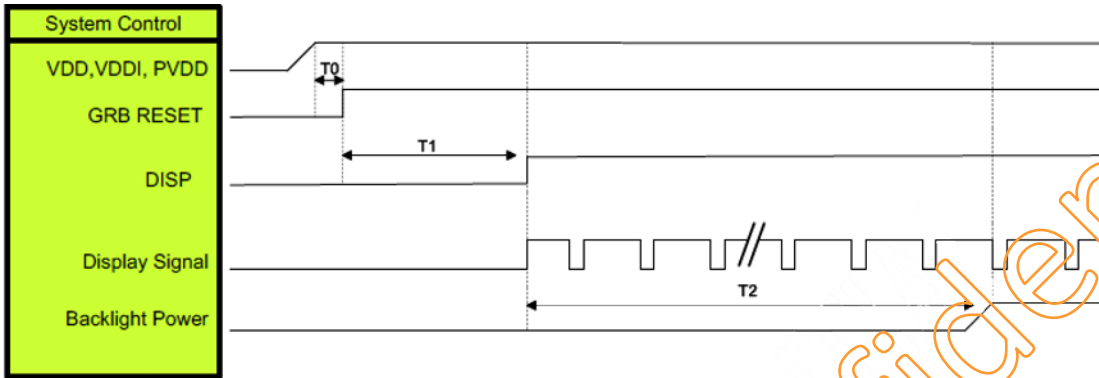
Symbol	Description	Min Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET = High to DISP = High	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: RGB interface Display signal: DCLK, VSYNC, HSYNC, DE, DR[7:0], DG[7:0],DB[7.0]

Note: LVDS interface Display signal: DCLK P/N, RX[3:0]P/N

2. Power off
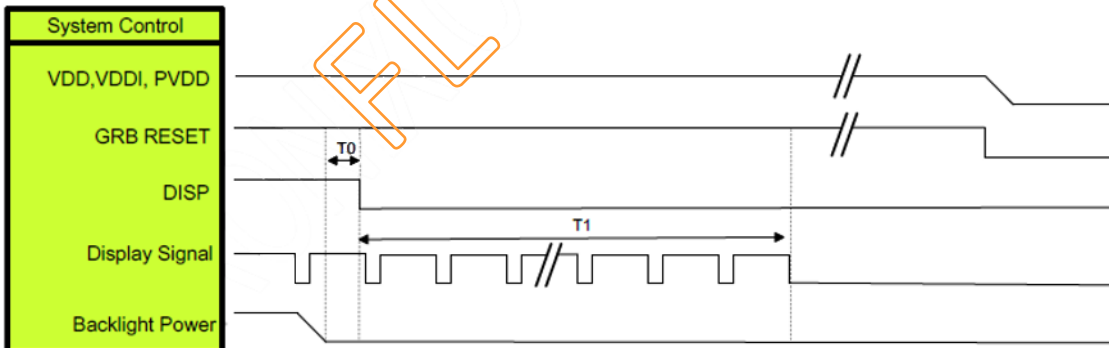
Item	Description	Min Time	Unit
T0	Backlight Power off to Disp = Low	5	ms
T1	DISP= Low to IC intimal voltage discharge complete	100	ms

Note: RGB interface Display signal: DCLK, VSYNC, HSYNC, DE, DR[7:0], DG[7:0],DB[7.0]

Note: LVDS interface Display signal: DCLK P/N, RX[3:0]P/N

5. INTERFACE PIN DESCRIPTION

TFT LCD Module CN2 (Input signal): FPC Down Connector (FH19SC-40S-0.5SH(HIROSE), 40pin pitch=0.5mm

Terminal no.	Symbol	I/O	Function
1	VLED-	P	Power for LED backlight cathode
2	VLED+	P	Power for LED backlight anode
3	GND	P	Power Ground
4	VDD	P	Power Voltage
5	R0	I	Data Input(LSB)
6	R1	I	Data Input
7	R2	I	Data Input
8	R3	I	Data Input
9	R4	I	Data Input
10	R5	I	Data Input
11	R6	I	Data Input
12	R7	I	Data Input (MSB)
13	G0	I	Data Input (LSB)
14	G1	I	Data Input
15	G2	I	Data Input
16	G3	I	Data Input
17	G4	I	Data Input
18	G5	I	Data Input
19	G6	I	Data Input
20	G7	I	Data Input (MSB)
21	B0	I	Data Input (LSB)
22	B1	I	Data Input
23	B2	I	Data Input
24	B3	I	Data Input
25	B4	I	Data Input
26	B5	I	Data Input
27	B6	I	Data Input
28	B7	I	Data Input (MSB)
29	DGND	I	Digital Ground
30	DCLK	I	Pixel 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	NC/XR	I/O	Right electrode differential analog
38	NC/YD	I/O	Bottom electrode differential analog
39	NC/XL	I/O	Left electrode differential analog
40	NC/YU	I/O	Top electrode differential analog

6. BLOCK DIAGRAM

The following diagram shows the functional block of the TFT module:
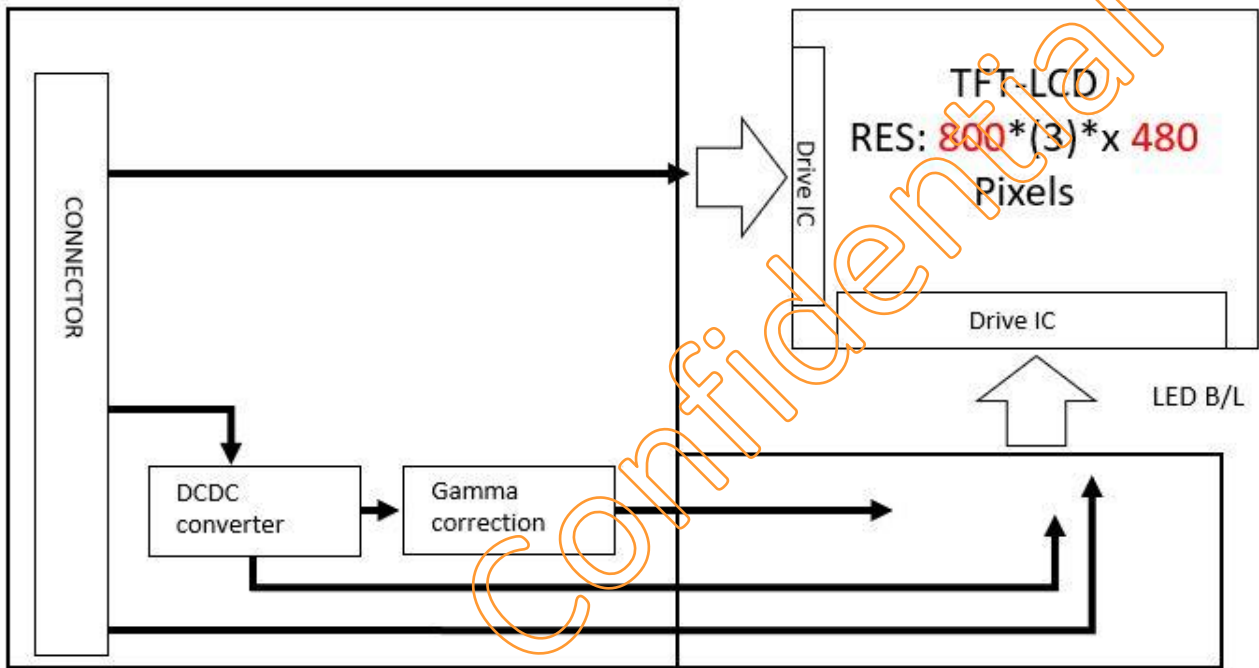
7. OPTICAL CHARACTERISTIC

The optical characteristics are measured under stable conditions at room temperature.

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing Angle	Horizontal	θx+	Center CR≥10	--	85	--	Deg.	
		θx-		--	85	--		
	Vertical	θY+		--	85	--		
		θY-		--	85	--		
Contrast Ratio		CR	θx=θy =0°	800	1000	--		Note 1,2
Response time		Rising +Falling	Center θx=θy =0°	--	30	40	ms	Note 5
Uniformity (9P)		YU	θx=θy =0°	--	70	--	%	Note1,3
Brightness		L	θx=θy =0°	800	900	--	cd/㎡	Note 1
Chromaticity	xW		Center θx=θy =0°	-0.05	0.32	+0.05		Note 1,2
	yW				0.34			
	xR				TBD			
	y R				TBD			
	xG				TBD			
	y G				TBD			
	xB				TBD			
	y B				TBD			

The following optical specifications shall be measured in a darkroom or equivalent state

(ambient luminance ≤1 lux, and at room temperature).

The operation temperature is 25°C±2°C

Note 1: The method of optical measurement

The LCD module should be turn-on to a stable luminance level to be reached. The measurement
should be executed after lighting Backlight for 20 minutes and in a dark room.
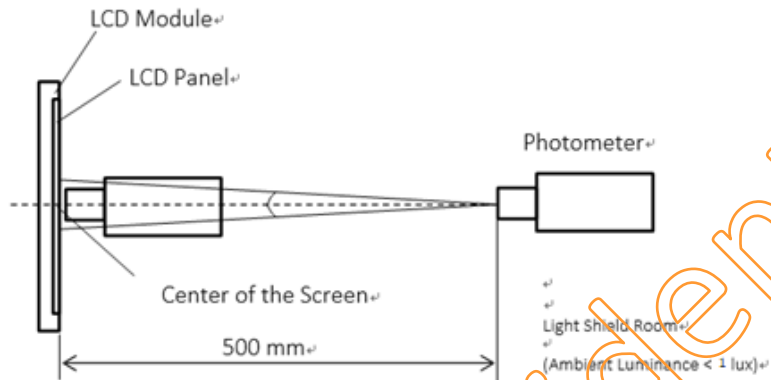
Note 2: Definition of Contrast Ratio

Measure the viewing angle of Θ= 0 and at the center of the LCD surface. Luminance with all pixels in
white state divide by Luminance with all pixels in Black state

Note 3: Definition of Luminance and Luminance uniformity
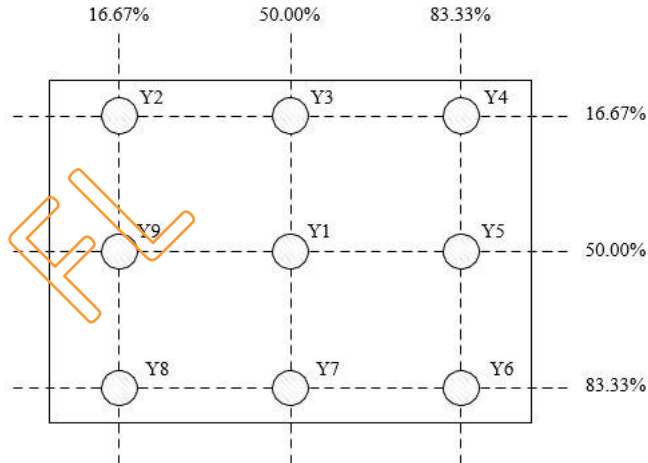
Minimum luminance values of 9 points divide by Maximum luminance of 9 points.

Note 4. Definition of view angle

Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for

the horizontal or the vertical clock direction with respect to the optical axis   which is normal to the LCD surface.
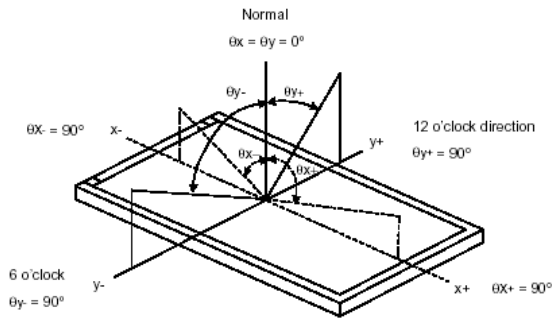
Note 5. Definition of Response time

The response time is set initially by defining the "Rising Time (Tr)" and the "Falling Time (Tf)" respectively. The response time interval is between 10% and 90% of amplitudes, please refer the figure to the followings:
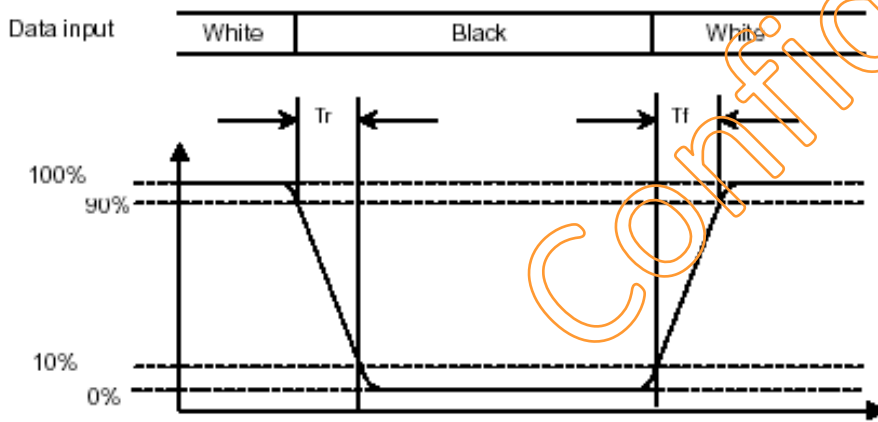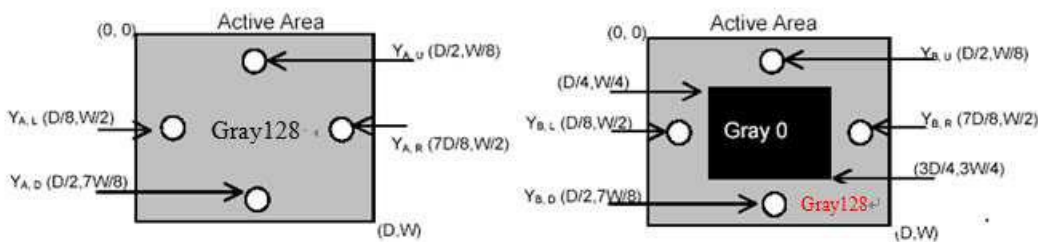

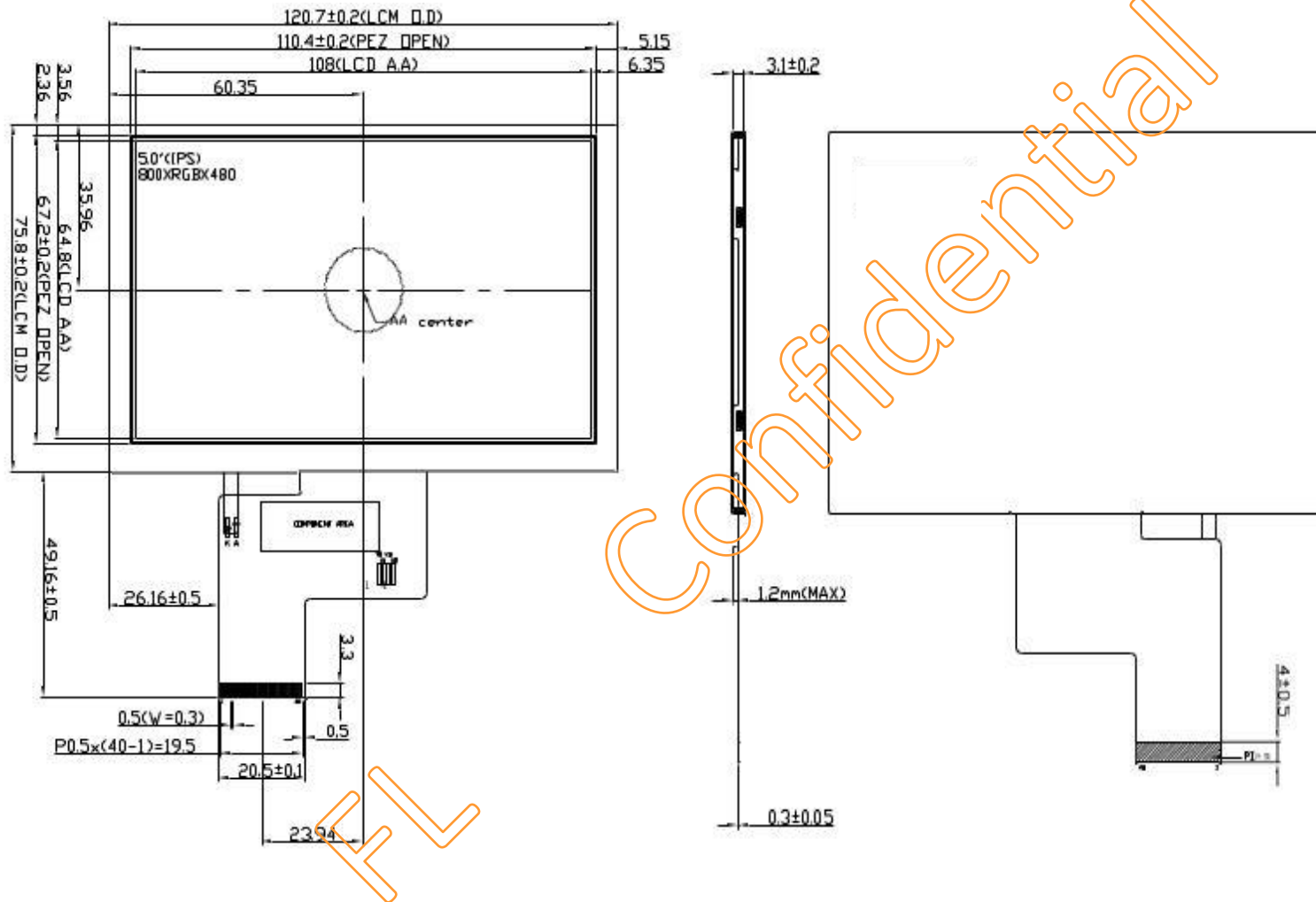Note 6: Crosstalk Modulation Ratio

CT= (YB-YA)/ YA×× 100%

YA 、 YB measure position and definition

YA means luminance at gray level 128(exclude gray level 0 pattern)

YB means luminance at gray level 128(include gray level 0 pattern)

8. Outline dimension

9. PRECAUTION AND PRODUCT HANDLING

- Do not apply the external force such as bending or twisting to the LCD panel and backlight during assembly.
- Do not insert and plug out the input connector while the LCD panel is operating.
- Do not take apart the panel or frame from LCD module assembly or insert anything into the backlight unit.
- Do not keep the same pattern in a long period of time, it may cause image sticking on LCD panel. Can use shuffle content periodically if fixed pattern is displayed on the screen.
- Do not touch the display area with bare hands, this will stain the display area.
- Pay attention to handle lead wire of backlight, that is not tugged in connect with LED driver.
- Do not change variable resistance settings in LCD panel, it may cause not satisfy of LCD characteristics specification.
- The surface of LCD panel's polarizer is very soft and easily scratched, please use a very soft dry cloth without chemicals for cleaning.
- To avoid the static electricity to damage the CMOS LSI, the operator should be grounded when in contact with the LCD panel, and also to all electrical equipment.
- Need to follow the correct power frequency when LCD panel is connecting and operating, this can avoid damage to CMOS LSI during latch-up.
- Need to store the LCD panel indoor without the exposure of sunlight where the temperature is 25°C ± 5°C and the humidity is below 60% RH.