

TFT Product Specification

- ◇ PRELIMINARY SPECIFICATION
- ◆ APPROVED SPECIFICATION

Part Number: FLC-050DMT8000SA1

Description : TFT 5''W, 800(H)*480(V),24bit RGB, Full Viewing Angle
1000CD

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Revision History

Version	Date	Page	Description	Note
V1.0	2019/9/11		1 st release	
V2.0	2019/11/28		2 nd release	
V3.0	2021/03/04		3 rd release	
V4.0	2021/03/09		4 th release	

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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	124.0(H) x 80.0(V) x 6.7(D)	mm
4	Active Area	108.0 (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	24bit RGB	
10	Surface Treatment	Anti-Glare	--
11	Brightness	1000 (Min)	cd/m2
12	Contrast Ratio	1000 (Typ.)	--
13	Module Weight	84	g



2. ABSOLUTE MAXIMUM RATING

2.1 Electrical Absolute Rating

Item	Symbol	Values		Unit	Remark
		Min	Max		
Logic power supply	VDD	-0.3	+3.96	V	
Analog supply voltage	VCC	-0.3	+4.0	V	
Single LED forward current	IF	-	150	mA	

2.2 Environment Absolute Rating

Item	Symbol	Values		Unit	Remark
		Min	Max.		
Operating Temperature	Top	-30	85	°C	
Storage Temperature	Tstg	-40	90	°C	

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°C

Note 3. GND=0V

Note 4. Panel surface temperature should not exceed 85°C



3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage	VDD	3.15	3.3	3.45	V	
TFT gate ON voltage	VGH	14.5	16	17.5	V	
TFT gate OFF voltage	VGL	-13.5	-12	-10.5	V	
TFT common electrode voltage	Vcom	-2.1	-1.6	-1.1	V	NOTE1
Current of power supply	IDD	-	130	200	mA	

NOTE 1. Vcom must be adjusted to optimize display quality.

3.2 BACK LIGHT

3.2.1 ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Supply voltage of LED backlight	VLED	Backlight current = 100mA	14	17.2	20.2	V	
	ILED1..2	Per LED string	-	50	-	mA	Note 2
Total Supply current of LED Backlight	ILED	ILED1+ILED2	-	100	-	mA	Note 1,3,4
Backlight Power Consumption	PLED	-	-	1.72	-	W	Note 2
LED life time			30,000			hrs	

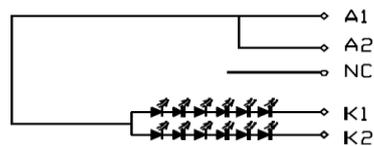
NOTE 1. The LED driving condition is defined for each LED module.

$$\text{Input current} = 50\text{mA} \times 2 = 100\text{mA}$$

NOTE 2. Backlight power consumption is calculated by $I_{LED} \times V_{LED}$

NOTE 3. Backlight driving current best at 100mA or below, and should not significantly exceed 100mA at all temperature; otherwise, overheating may happen and may damage the backlight.

NOTE 4. Backlight Circuit Diagram



4. SIGNAL CHARACTERISTICS

4.1 LCD Interface Timing

Symbol	Parameter	Conditions	Related Pins	Min.	Typ.	Max.	Unit
VP	Vertical cycle	$VP = VBP + VDISP + VFP$	VSD	490	505	528	Line
VS	VSD Low Pulse Width	-	VSD	1	2	42	Line
VBP	Vertical Back Porch	-	VSD	5	5	5	Line
VFP	Vertical Front Porch	-	VSD	5	20	43	Line
VDISP	Vertical Active Area	-	VSD, HSD	480	480	480	Line
HP	Horizontal cycle	$HP = HBP + HDISP + HFP$	HSD	856	860	920	DCLK
HS	HSD Low Pulse Width	-	HSD	1	2	100	DCLK
HBP	Horizontal Back Porch	-	HSD	16	16	16	DCLK
HFP	Horizontal Front Porch	-	HSD	19	44	115	DCLK
HDISP	Horizontal Active Area	-	HSD, DCLK	800	800	800	DCLK
F _{frame}	Frame Frequency	-	DCLK	55	59.19	60	Hz
1/t _{DCLK}	DCLK Frequency	-	DCLK	25.2	25.9	29.1	MHz
t _{DLW}	DCLK Low time	-		6	-	-	ns
t _{DHW}	DCLK High time	-	DCLK	6	-	-	ns
t _{DDS}	R,G,B[0-5] setup time	-	DCLK, R,G,B[0-5]	5	-	-	ns
t _{DDH}	R,G,B[0-5] hold time	-	DCLK, R,G,B[0-5]	5	-	-	ns
t _{DSYN}	HSD and VSD setup time	-	DCLK, HSD, VSD	5	-	-	ns

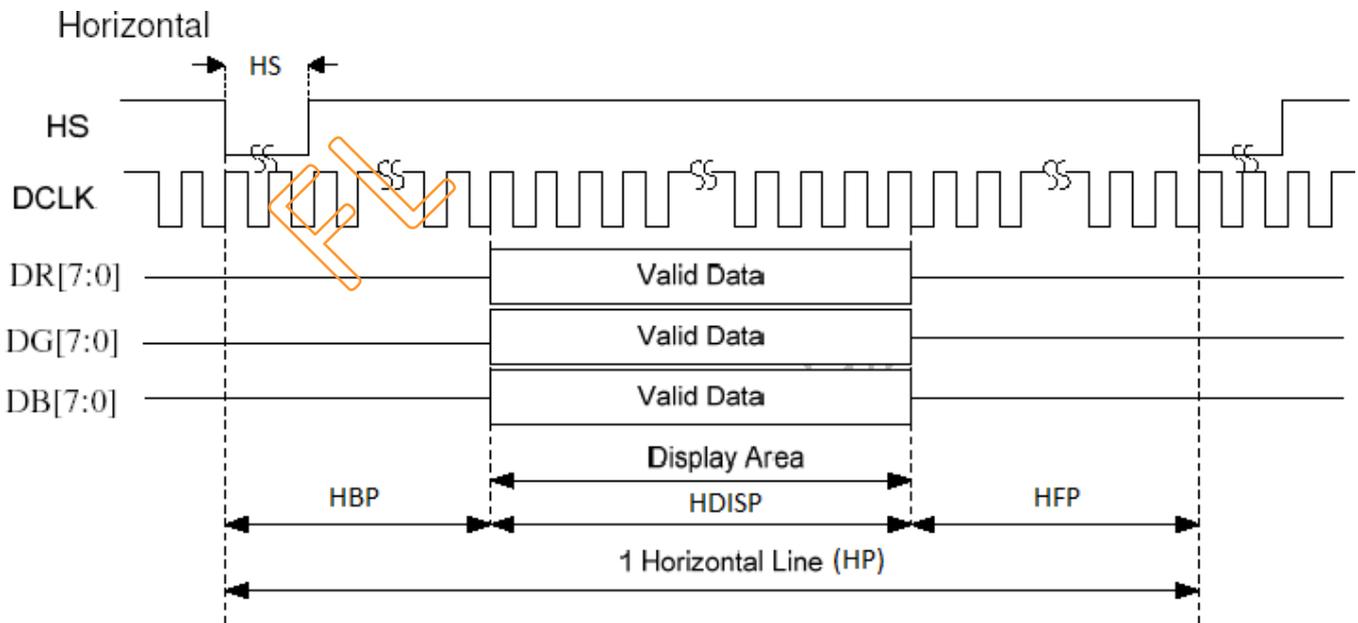


Figure : Horizontal input timing at Sync mode

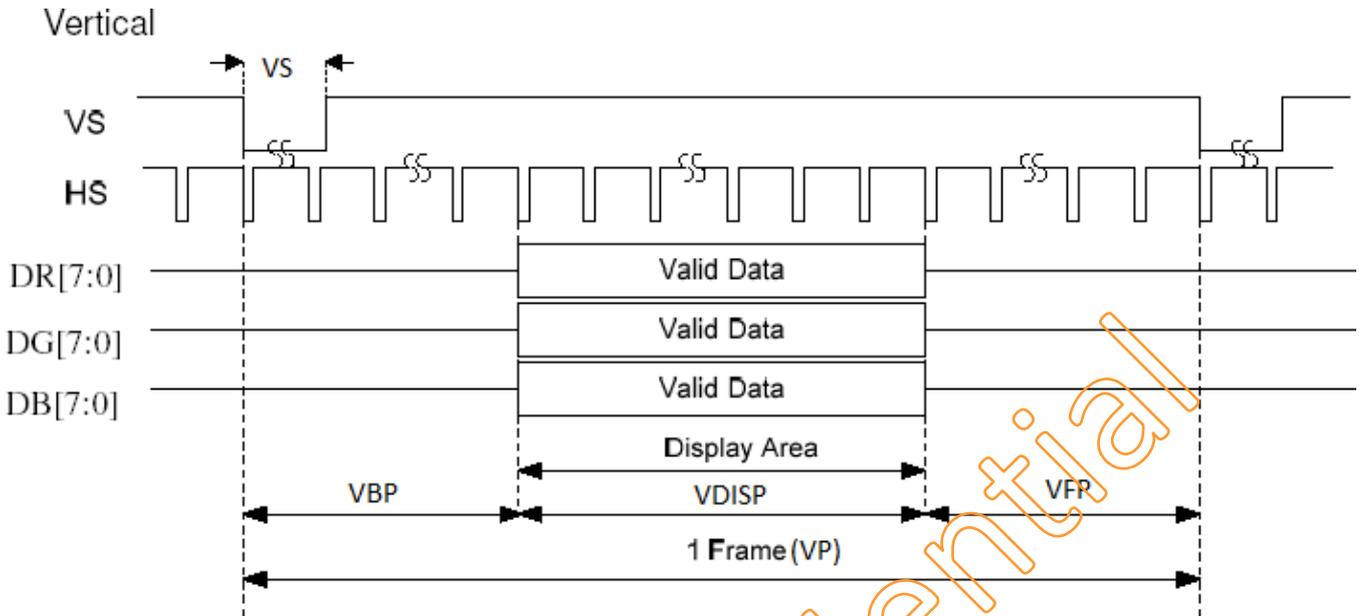
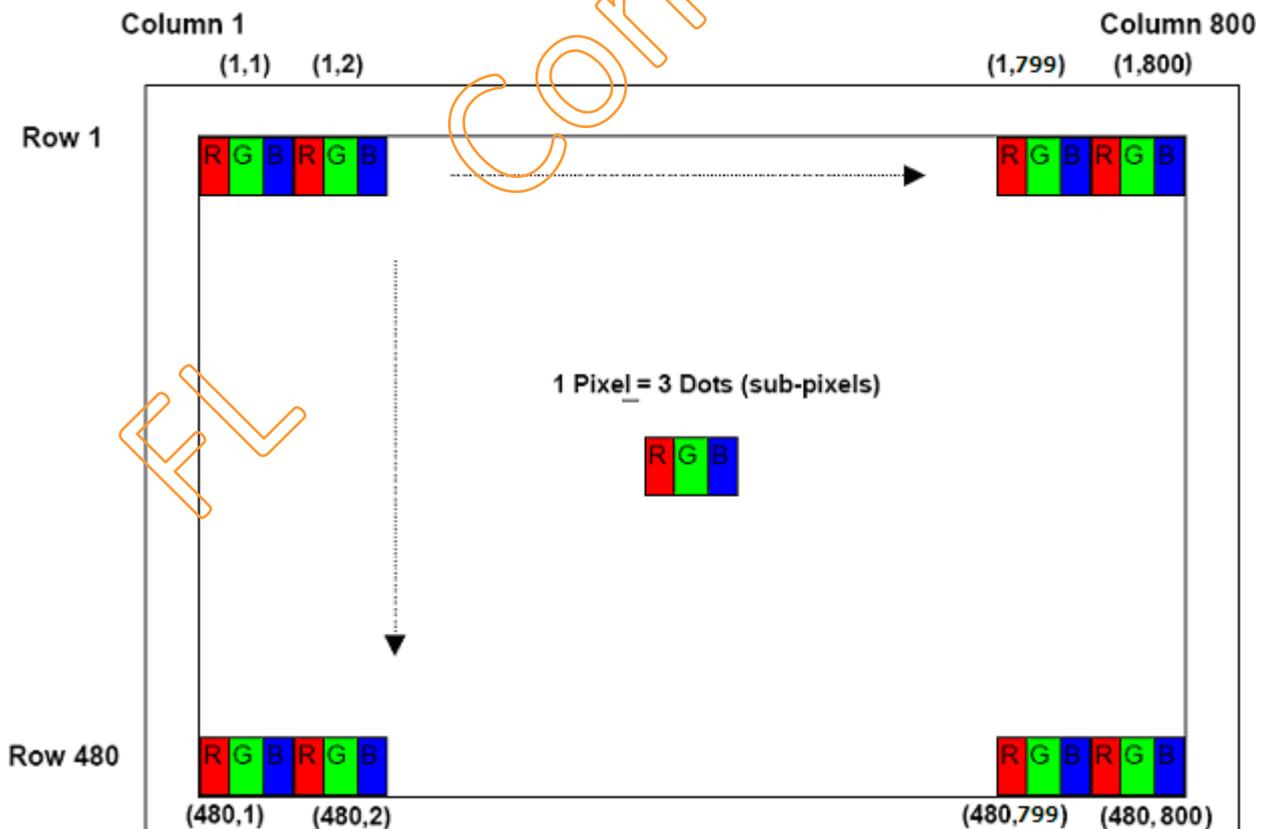
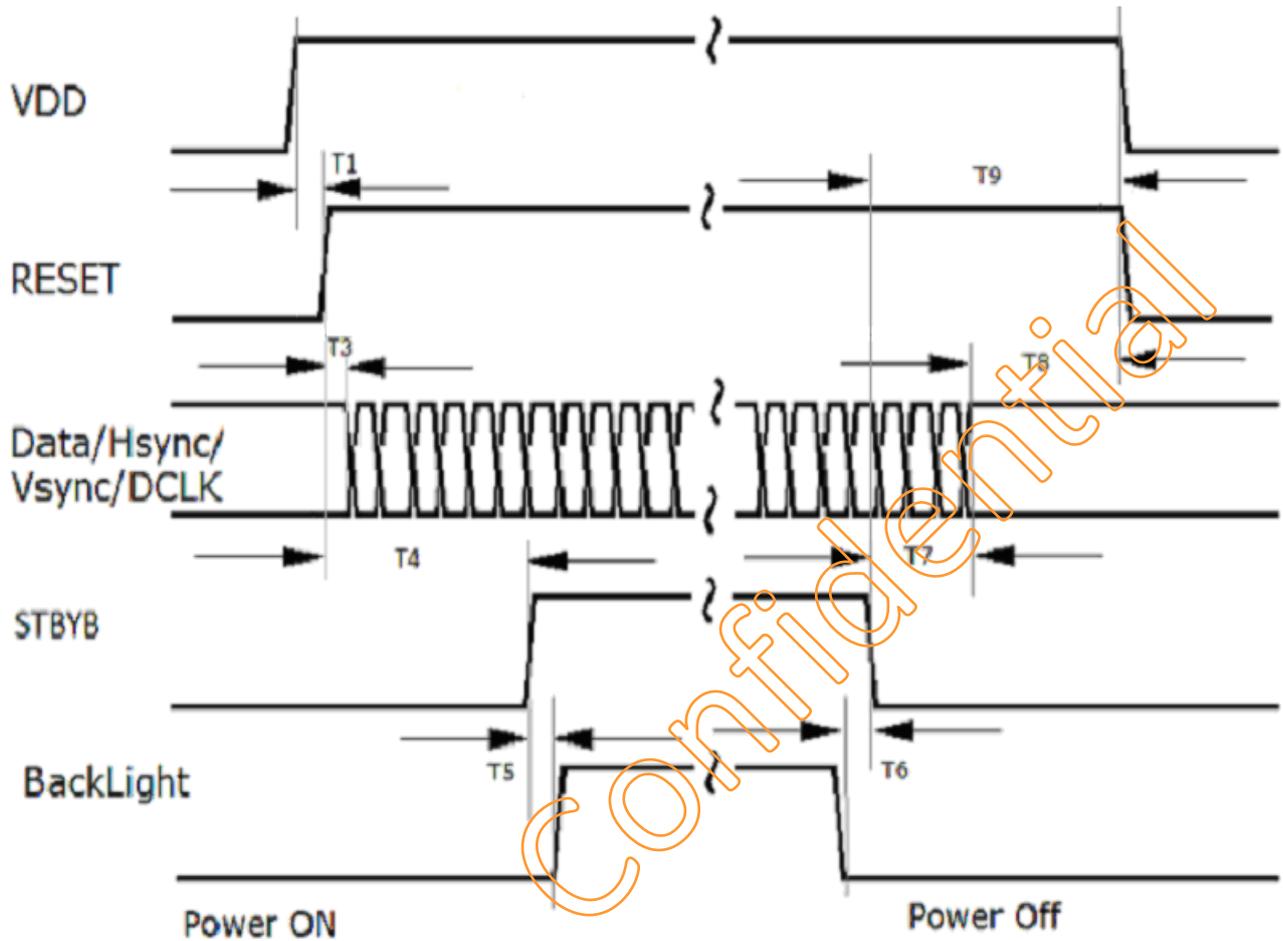


Figure : Vertical input timing at Sync mode

4.2 Pixel Arrangement



4.3 Power on/off sequence



Symbol	Peremeter	Min.	Typ.	Max.	Unit	Remarks
T1	VDD Ready to RESET finish	15	-	-	us	
T3	RESET finish to Data	8	-	-	ms	
T4	RESET finish to STBYB Enable	24	-	-	ms	
T5	STBYB Enable to Backlight On	7.5	-	-	frame	
T6	Backlight Off to STBYB Standby	0	-	-	frame	
T7	STBYB Standby to Data off	8	-	-	frame	
T8	Data off to Reset falling	0	-	-	ms	
T9	STBYB Standby to Reset falling	8	-	-	frame	

5. INTERFACE PIN DESCRIPTION

5.1 TFT-LCD Panel

Connector Type : JST 50FHH-SM1-GAN-TF

Terminal no.	Symbol	Function	Notes
1	GND	Ground	
2	VDD	3.3V Power for Logic	Connect to 3.3V power
3	VCC	3.3V power for DCDC	Connect to 3.3V power
4	GND	Ground	
5	CS	SPI Chip select	H: disable L: Enable
6	SCL	SPI CLOCK	Raise edge data latch
7	SDA	SPI Data	In / out
8	STB	Standby Pin	H: Normal operating mode L: Standby mode
9	RST	Reset pin	H: Normal operating mode L: Reset
10	VS	V sync	H: normal L: Active
11	HS	H sync	H: normal L: Active
12	GND	Ground	
13	DCLK	Pixel Clock	Fall edge data latch
14	GND	Ground	
15	R7	Red Data 7	
16	R6	Red Data 6	
17	GND	Ground	
18	R5	Red Data 5	
19	R4	Red Data 4	
20	GND	Ground	
21	R3	Red Data 3	
22	R2	Red Data 2	
23	GND	Ground	
24	R1	Red Data 1	
25	R0	Red Data 0	
26	GND	Ground	
27	G7	Green Data 7	
28	G6	Green Data 6	
29	GND	Ground	
30	G5	Green Data 5	
31	G4	Green Data 4	
32	GND	Ground	
33	G3	Green Data 3	
34	G2	Green Data 2	

35	GND	Ground	
36	G1	Green Data 1	
37	G0	Green Data 0	
38	GND	Ground	
39	B7	Blue Data 7	
40	B6	Blue Data 6	
41	GND	Ground	
42	B5	Blue Data 5	
43	B4	Blue Data 4	
44	GND	Ground	
45	B3	Blue Data 3	
46	B2	Blue Data 2	
47	GND	Ground	
48	B1	Blue Data 1	
49	B0	Blue Data 0	
50	GND	Ground	

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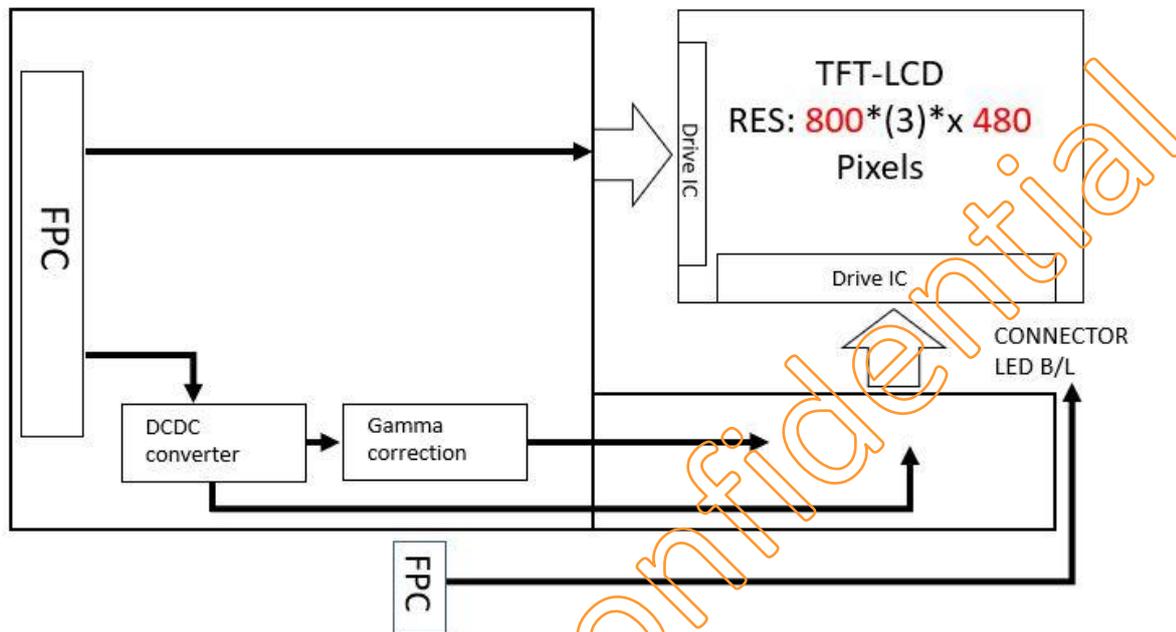
5.2 LED Backlight Driving

LED bar connector: HIROSE FH52-8S-0.5-SH

Pin	Symbol	Description	Remark
1	A1	LED anode.	
2	A2	LED anode.	
3	NC	Not connected.	
4	K1	LED Cathode.	
5	K2	LED Cathode.	
6	NC	Not connected.	
7	NTC1	NTC1.	
8	NTC2	NTC2.	

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	θ_{x+}	Center $CR \geq 10$		80	--	Deg.	
		θ_{x-}			80	--		
	Vertical	θ_{Y+}			80	--		
		θ_{Y-}			80	--		
Contrast Ratio		CR	$\theta_x = \theta_y = 0^\circ$	800	1000	--		Note 1,2
Response time		Rising +Falling	Center $\theta_x = \theta_y = 0^\circ$	--	--	40	ms	Note 5
Brightness		L	$\theta_x = \theta_y = 0^\circ$	1000	--	--	cd/m^2	Note 1
Chromaticity	xW	Center $\theta_x = \theta_y = 0^\circ$	-0.03	+0.03	0.318			Note 1,2
	yW				0.342			
	xR				0.633			
	y R				0.344			
	xG				0.326			
	y G				0.622			
	xB				0.146			
	y B				0.098			

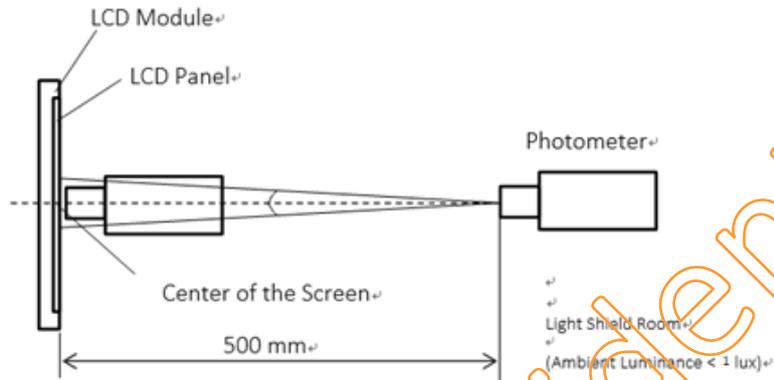
The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance ≤ 1 lux, and at room temperature).

The operation temperature is $25^\circ\text{C} \pm 2^\circ\text{C}$



Note 1: The method of optical measurement

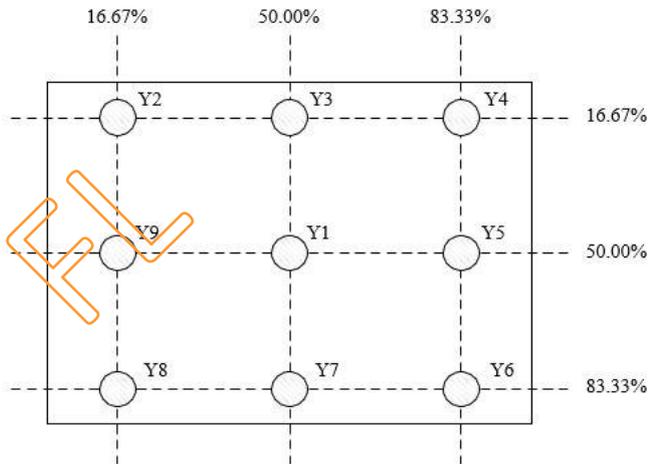
The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 20 minutes and in a dark room.



Note 2: Definition of Contrast Ratio

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

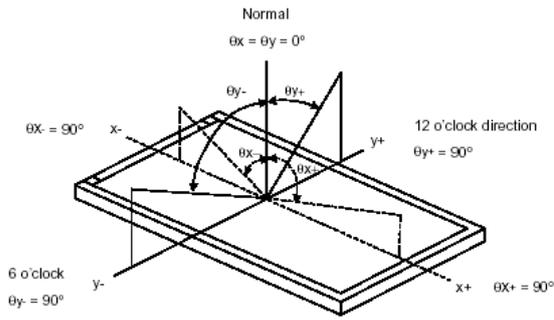
Note 3: Definition of Luminance and Luminance uniformity



Minimum luminance values of 9 points divide by Maximum luminance of 9 points.

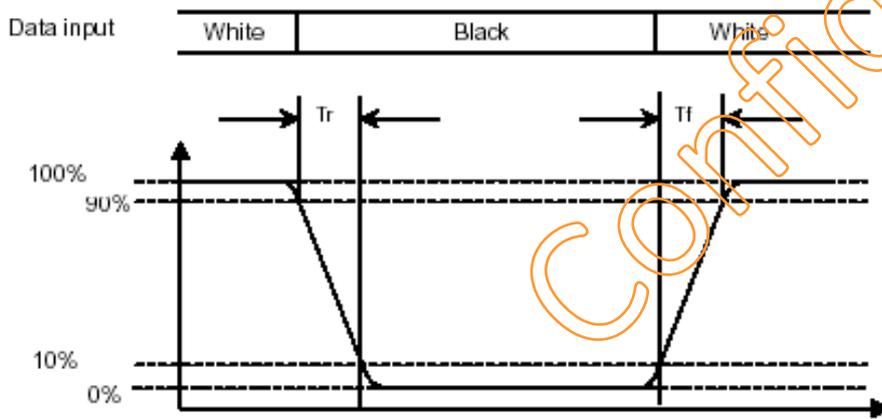
Note 4. Definition of view angle

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:



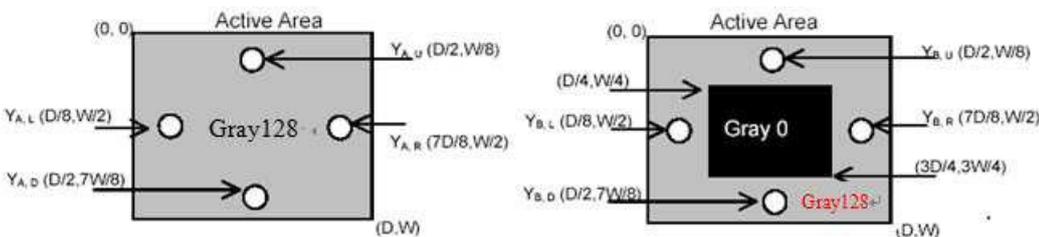
Note 6: Crosstalk Modulation Ratio

$$CT = (Y_B - Y_A) / Y_A \times 100\%$$

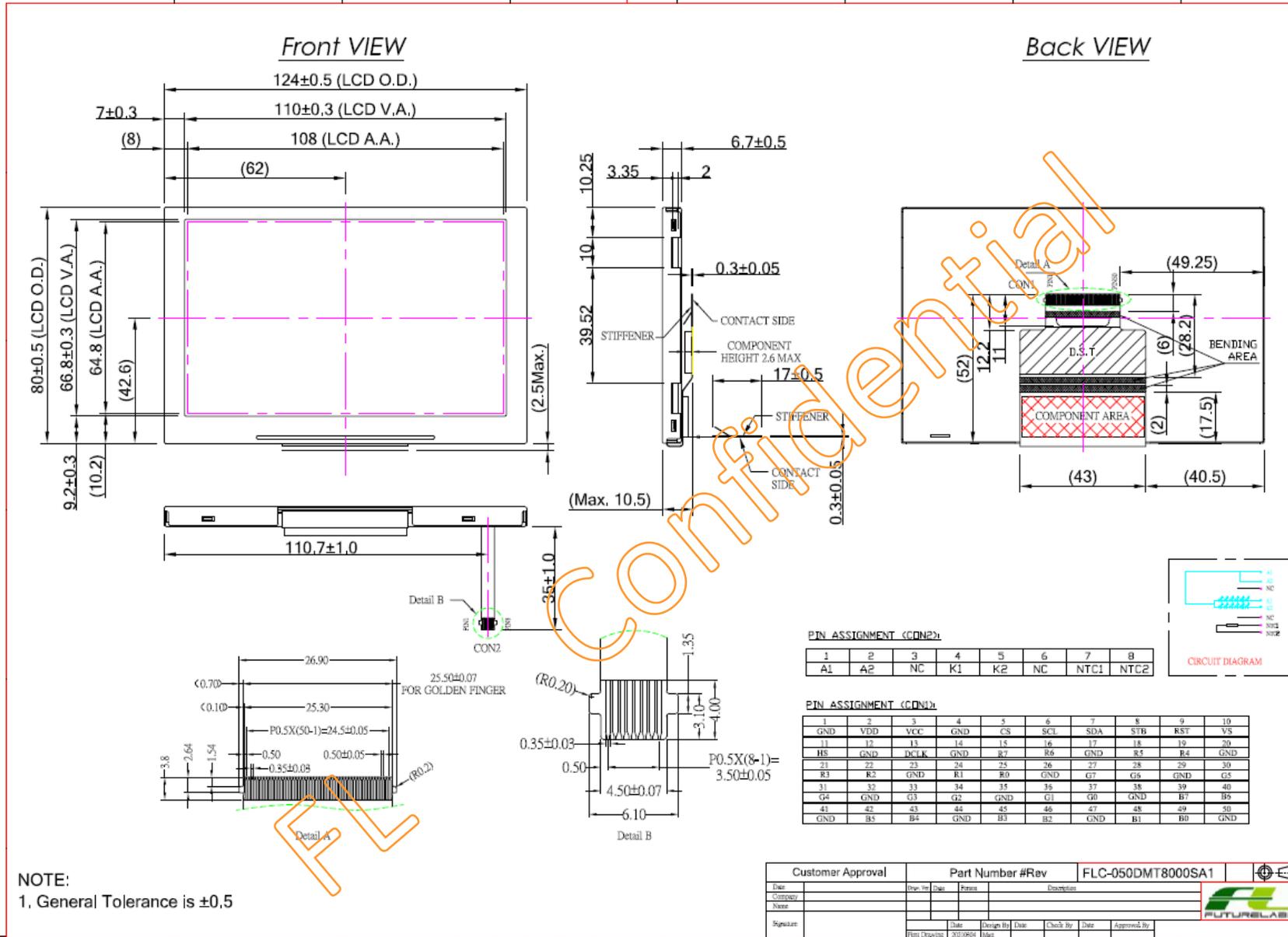
Y_A、Y_B measure position and definition

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

Y_B 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 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 60% RH.

