

Product Specification

PART NUMBER # REV: FLC-121HML6000SA1#00

DESCRIPTION: TFT 12.1", 1280(H)*800(V), LVDS,
262K/16.7M colors, 1000CD with A/K

- Preliminary Specification
- Approved Specification

Customer Name:	
Signature:	Date:

PREPARED BY	REVIEWED BY
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Revision History

Version	Date	Page	Description	Note
V1.0	2021/04/08		1st initial	
V1.1	2021/05/21		Update	

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1. GENERAL DESCRIPTION

1.1 Description

12.1 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 1280 x 800 screen.

1.2 Product Summary

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

No.	Item	Specification	Unit
1	Display Size	12.1"	Inch
2	Pixel Number	1280(H) x 3(RGB)x 800 (V)	Pixels
3	Outline Dimension	278(W) x 184(H) x 10.5(D)(Max.)	mm
4	Active Area	261.12 (W) x 163.2 (H)	mm
5	Pixel Pitch	0.204 (H) x 0.204 (V)	mm
6	Display Colors	16.7M / 262K	
7	Pixel Arrangement	RGB vertical stripe	--
8	Display Mode	Normally Black	--
9	Electrical Interface	LVDS	--
10	Surface Treatment	Anti-Glare	
11	Brightness	1000 (Typ.)	cd/m2
12	Contrast Ratio	1000 (Typ.)	--
13	Power Consumption	VDD=1.45W (white pattern), BLU with Converter=9.9 (Typ.)	W

2. ABSOLUTE MAXIMUM RATING

2.1 Electrical Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max		
Power Supply Voltage	VCC	-0.3	-	4	V	
Logic Input Voltage	V _{IN}	-0.3	-	VCC+0.3	V	

2.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max		
Operating Temperature	Top	-30	-	+80	°C	
Storage Temperature	Tstg	-30	-	+85	°C	

Relative Humidity (%RH)

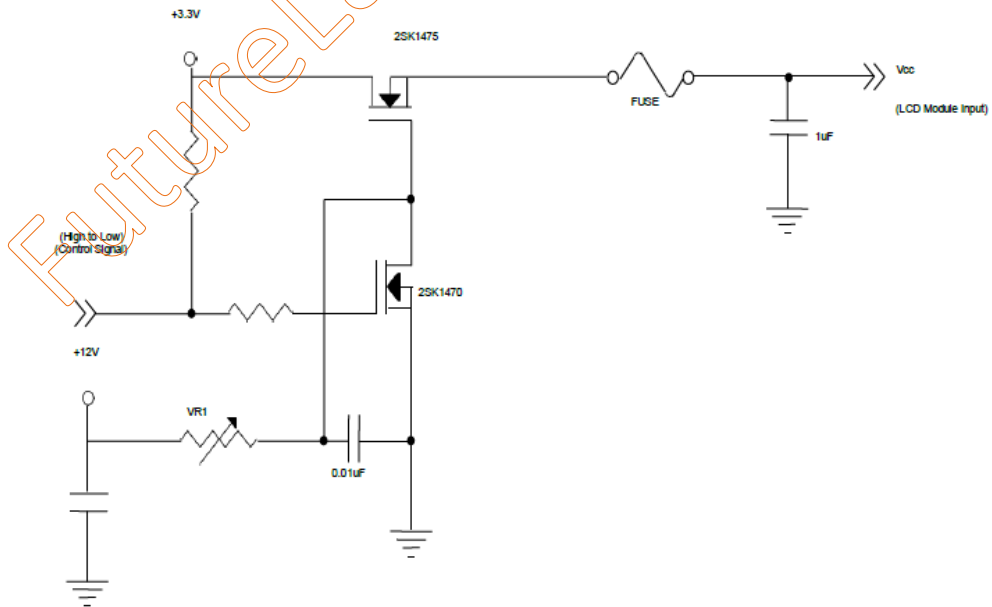
3. ELECTRICAL CHARACTERISTICS

3.1 LCD Electrical Specification

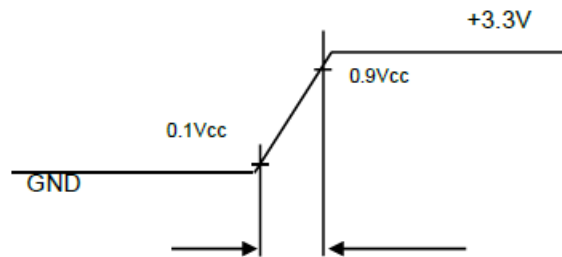
Parameter		Min.	Type	Max.	Unit.	Note
Power supply voltage	V_{CC}	3.0	3.3	3.6	V	
Permissible Ripple Voltage	V_{RP}	-	50	-	mV	
Rush Current	I_{RUSH}	1.5			A	(2)
Initial Stage Current	I_{IS}	-	-	1.0	A	(2)
Power Supply Current	White	400	440	480	mA	(3)a
	Black	260	290	320	mA	(3)b
LVDS differential input High Threshold	$V_{TH(LVDS)}$	100	-	-	mV	$V_{CM}=1.2V$
LVDS differential input Low Threshold	$V_{TL(LVDS)}$	-	-	-100	mV	$V_{CM}=1.2V$
LVDS Common Mode Voltage	V_{CM}	1.125	-	1.375	V	
LVDS Differential Input Voltage	$ V_{ID} $	100	-	600	mV	
Terminating Resistor	R_T	-	100	-	ohm	

Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:

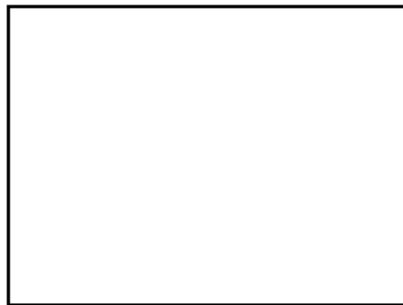


Vcc rising time is 470μs



Note (3) The specified power supply current is under the conditions at $V_{CC}=3.3V$, $T_a=25\pm 2^\circ C$, $F_V=60Hz$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



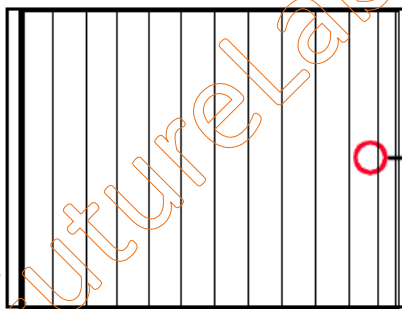
Active Area

b. Black Pattern

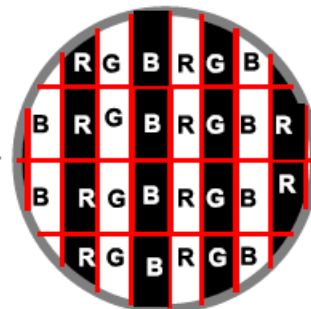


Active Area

c. Vertical Stripe Pattern



Active Area



3.2 Backlight Unit

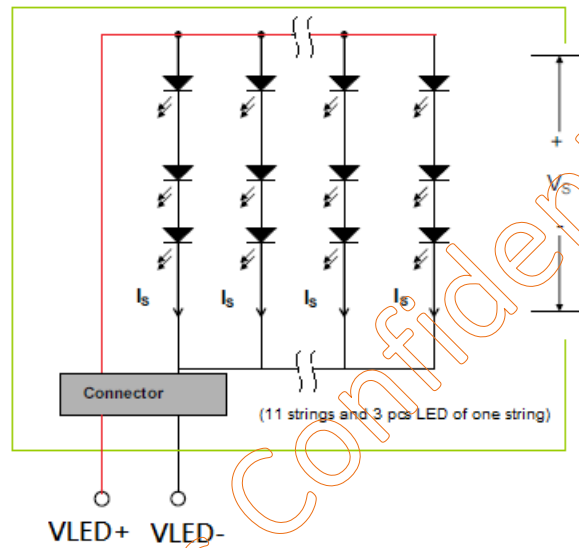
The following shows the block diagram of the 12.1 inch Backlight Unit. And it includes 33 pcs LED in the LED light bar. (11 strings and 3 pcs LED of one string).

Recommended Operating Condition: $T_a=25^{\circ}\text{C}$

Light Bar Forward Voltage: 16V~18V

Light Bar Forward Current: 550mA~600mA

Light Bar Life Time: Min. 70K Hours and Typ. 100K Hours



Note:

1. Light Bar cable: 25cm
2. Light Bar Connector: JST PH-2 or compatible

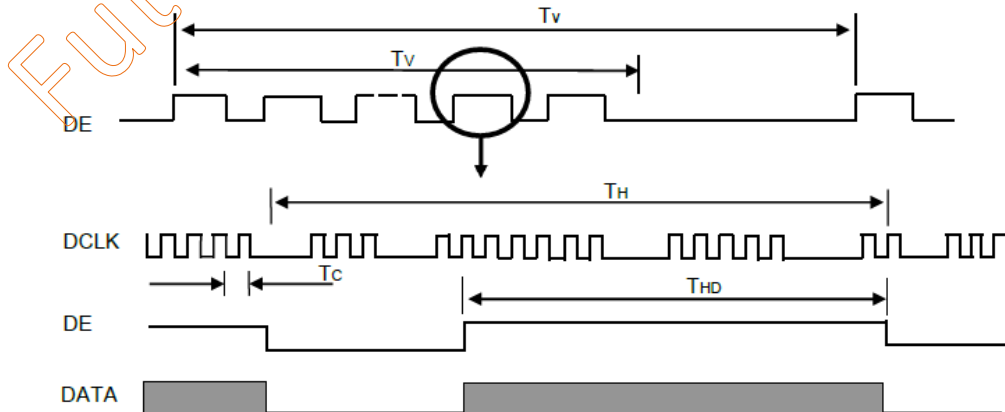
4.TIMING CHART

4.1 Timing Table

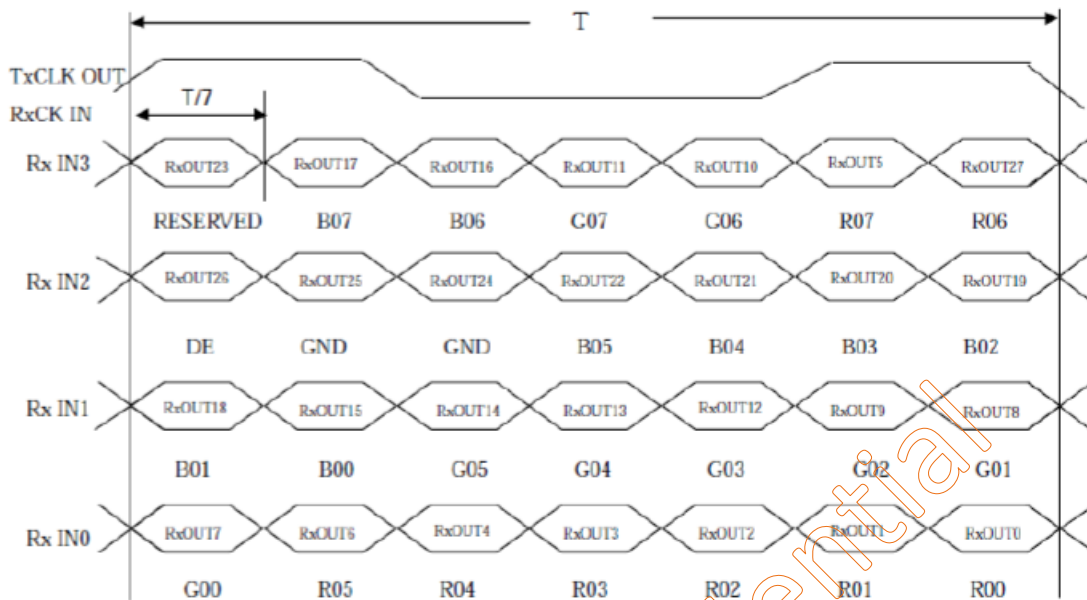
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	F _c	66.1	64.9	74.4	MHz	-
	Period	T _c	13.4	14.1	15.1	ns	
	Input cycle to cycle jitter	T _{rcl}	-	-	200	ns	
	Input Clock to data skew	TLVCCS	-0.02*T _c	-	0.02*T _c	ps	
	Spread spectrum modulation range	F _{clkin_mod}	-	-	1.02*F _c	MHz	
	Spread spectrum modulation frequency	F _{SSM}	-	-	200	KHz	
	High Time	T _{ch}	-	4/7	-	T _{ch}	
	Low Time	T _{cl}	-	3/7	-	T _{ch}	
Vertical Display Term	Frame Rate	Fr	-	60	-	Hz	T _v =T _v d+T _v b
	Total	T _v	810	823	830	Th	
	Active Display	T _v d	800			Th	-
	Blank	T _v b	10	23	30	Th	-
Horizontal Display Term	Total	T _h	1360	1440	1500	T _c	T _h =T _h d+T _h b
	Active Display	T _h d	1280			T _c	-
	Blank	T _h b	80	160	220	T _c	-

Note (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

Note (2) The T_v(T_vd+T_vb) must be integer, otherwise, the module would operate abnormally.

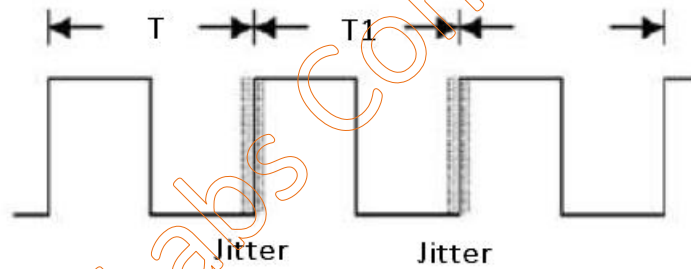


INPUT SIGNAL TIMING DIAGRAM

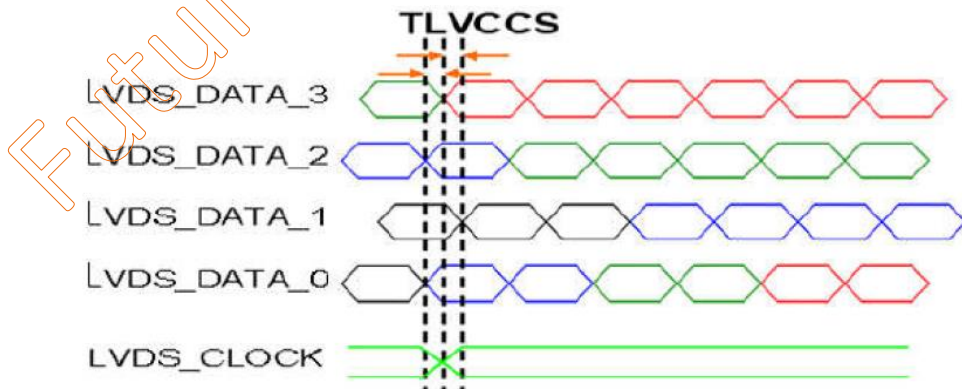


Timing Diagram of LVDS

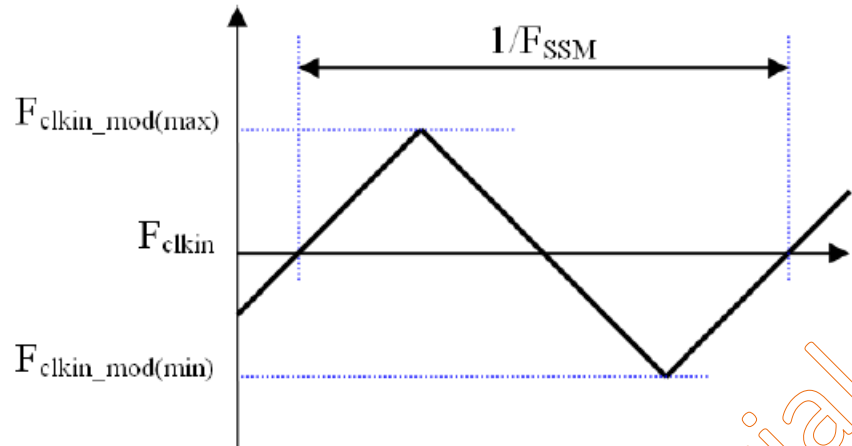
Note (a) The input clock cycle to cycle jitter is defined as below figures. $Trcl = |T1 - T|$



Note (b) Input Clock to data skew is defined as below figures.



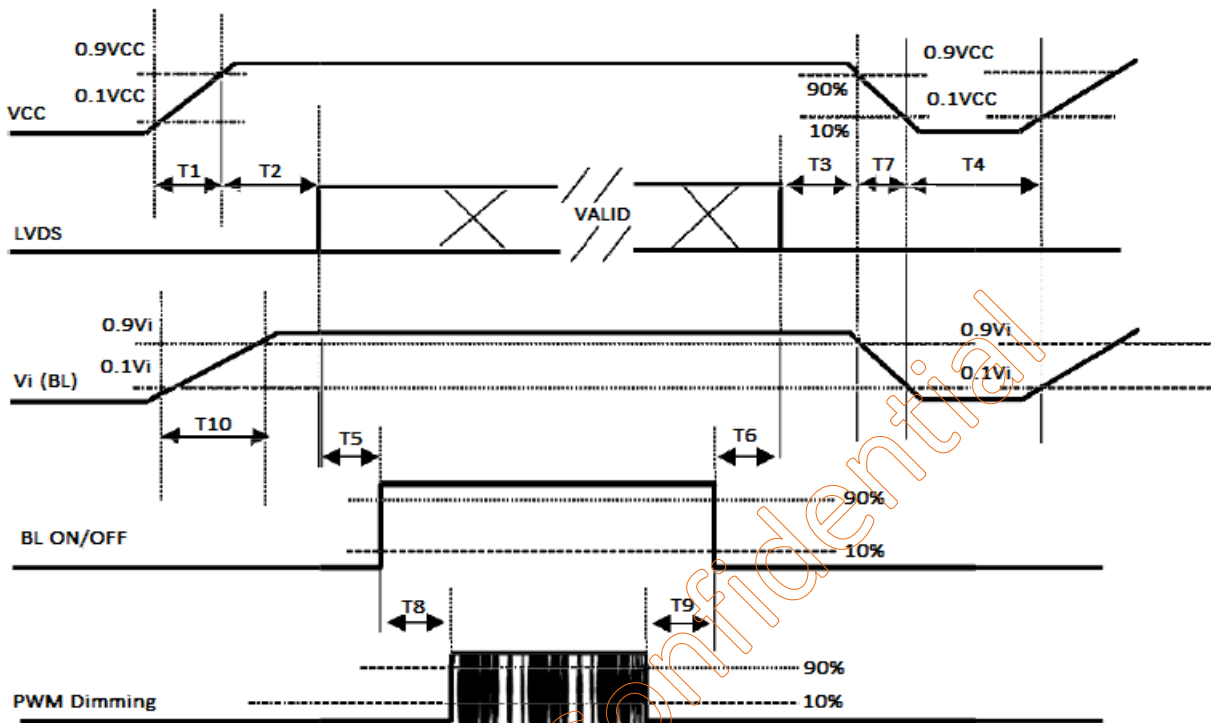
Note (c) The SSCG (Spread spectrum clock generator) is defined as below figures.



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4.2 Power On/Off Sequence

The power sequence specifications are shown as the following table and diagram.



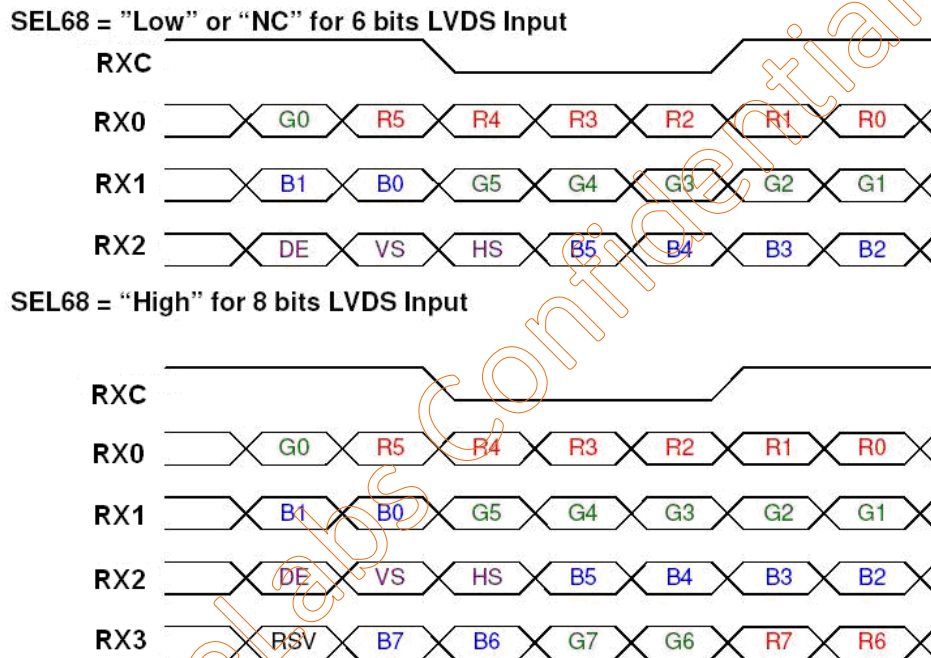
Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	450	-	-	ms
T6	200	-	-	ms
T7	10	-	100	ms
T8	10	-	-	ms
T9	10	-	-	Ms
T10	20	-	50	

Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

- Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.
- Note (4) T4 should be measured after the module has been fully discharged between power off and on period.
- Note (5) Interface signal shall not be kept at high impedance when the power is on.
- Note (6) We won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.
- Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "T7 spec".

4.3 The Input Data Format



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB.

Note (2) Please follow PSWG.

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 (MSB) GreenData 6 GreenData 5 GreenData 4 GreenData 3 GreenData 2 GreenData 1 GreenData 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
RXCLKIN+ RXCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

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5. INTERFACE PIN DESCRIPTION

5.1 LCM Connector PIN Assignment

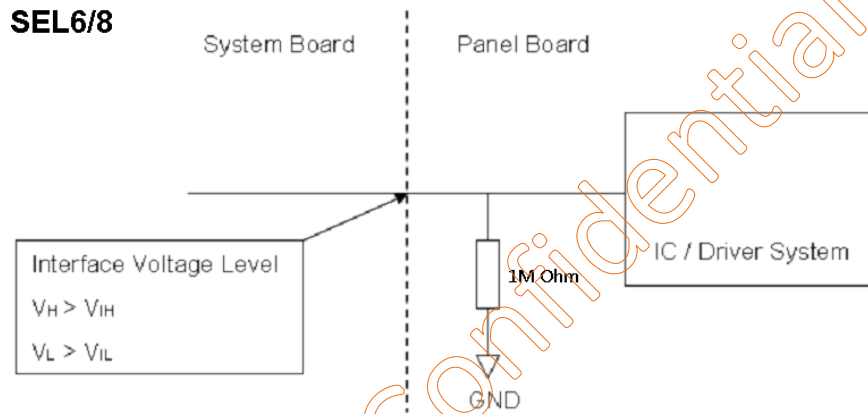
The electronics interface connector is P2 187114-30091 or equivalent.

Pin No.	Symbol	Functions	Note
1	NC	No Connection or Ground	-
2	NC	No Connection or Ground	-
3	NC	No Connection or Ground	-
4	NC	No Connection or Ground	-
5	NC	No Connection or Ground	
6	NC	No Connection or Ground	
7	NC	No Connection or Ground	-
8	NC	No Connection or Ground	-
9	VCC	Power supply: +3.3V	
10	VCC	Power supply: +3.3V	-
11	GND	Ground	-
12	GND	Ground	-
13	RX0-	Negative transmission data of pixel 0	-
14	RX0+	Positive transmission data of pixel 0	-
15	GND	Ground	-
16	RX1-	Negative transmission data of pixel 1	-
17	RX1+	Positive transmission data of pixel 1	-
18	GND	Ground	-
19	RX2-	Negative transmission data of pixel 2	-
20	RX2+	Positive transmission data of pixel 2	-
21	GND	Ground	-
22	RXCLK-	Negative of clock	-
23	RXCLK+	Positive of clock	-
24	GND	Ground	-
25	RX3-	Negative transmission data of pixel 3	-
26	RX3+	Positive transmission data of pixel 3	-
27	GND	Ground	-

Pin No.	Symbol	Functions	Note
28	SEL6/8	LVDS 6/8 bit select function control,	(1) (2)
		Low = 6bit Input Mode	
		High = 8bit Input Mode	
29	GND	Ground	
30	NC	No Connection or Ground	

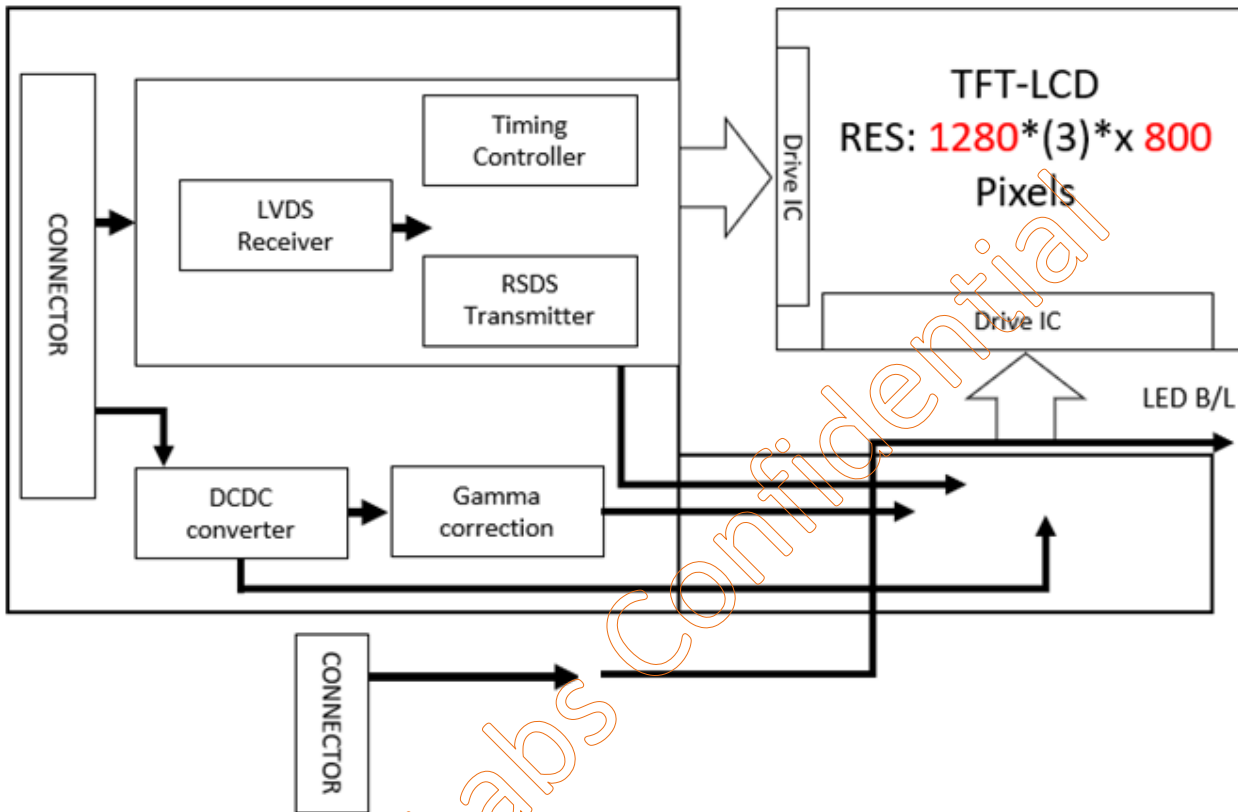
Note (1) "Low" stands for 0V. "High" stands for 3.3V, "NC" stands for "No Connected"

Note (2) SEL6/8 as shown below:



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.

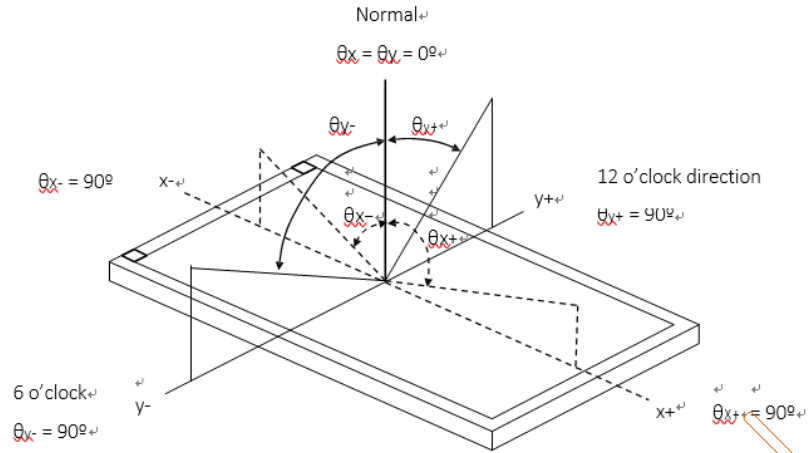
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	$\theta_x=0^\circ$	800	1000	-	-	(2)(5)
Response Time		T _R	25°C	-	12	17	ms	(3)
		T _F			8	13		
Center Luminance of White		LC	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing angle at normal direction	900	1000	-	cd/m ²	(4)(5)
White Variation		W		-	1.25	1.4		
Chromaticity	Red	R _x		Typ. -0.05	Typ. +0.05	0.652	-	(1) (5)
		R _y	0.338			-		
	Green	G _x	0.326			-		
		G _y	0.608			-		
	Blue	B _x	0.150			-		
		B _y	0.053			-		
	White	W _x	0.313			-		
		W _y	0.329			-		
Viewing Angle	Horizontal	θ_{x+}	80	88	-	Deg.	(1)(5)	
		θ_{x-}	80	88	-			
	Vertical	θ_{y+}	80	88	-			
		θ_{y-}	80	88	-			

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance <2 lux, and at room temperature).

The room temperature is 25°C±2°C.

Note 1: Definition of Viewing 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

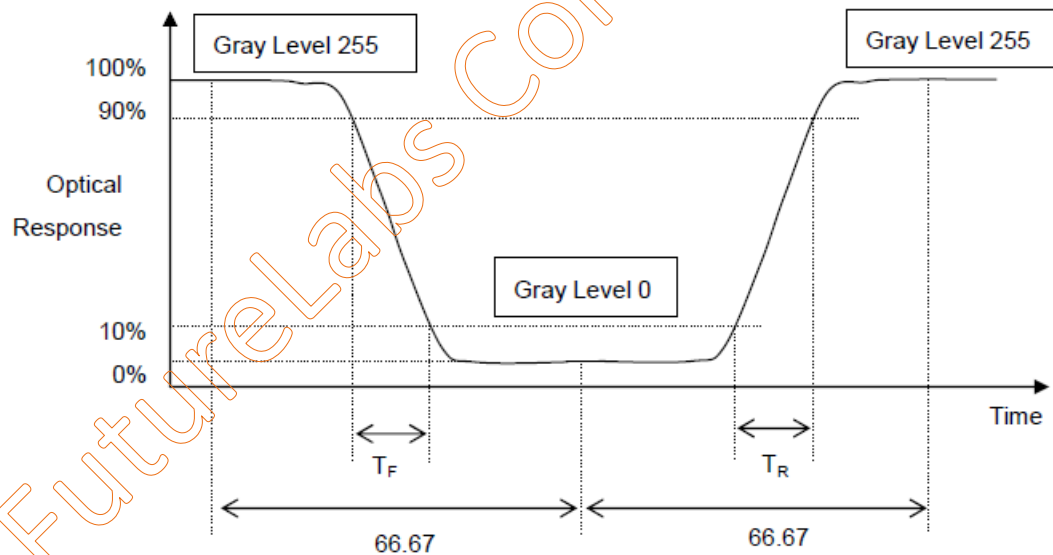


Note 2: Definition of Contrast Ratio (CR)

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 Response Time:

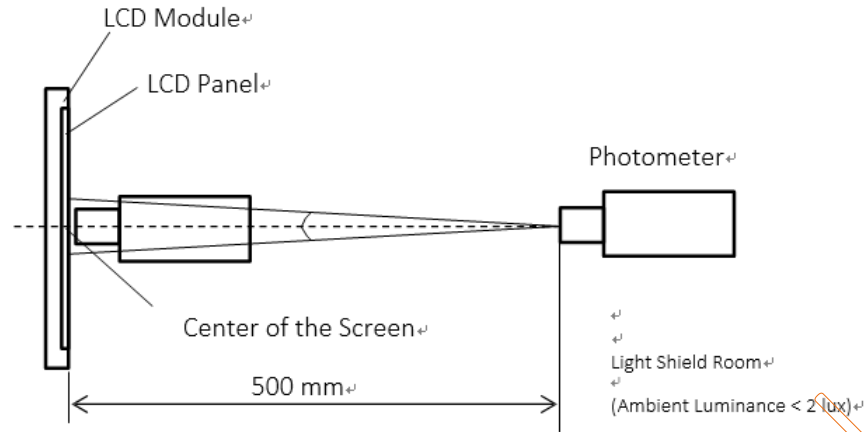
The response time is set initially by defining the "Rising Time (TR)" and the "Falling Time (TF)" respectively. Please refer the figure to the followings:



Note 4: Definition of Brightness (L)

Measure the center area of the panel and the viewing angle of the $\theta_x = \theta_y = 0^\circ$

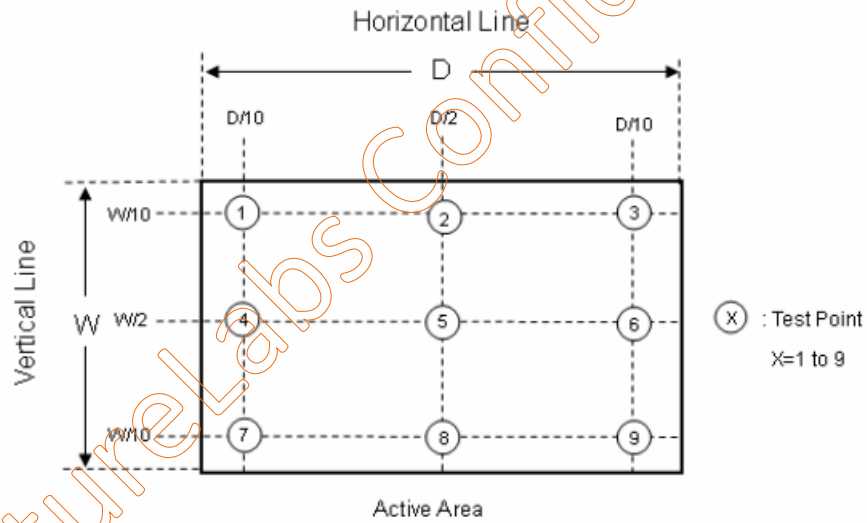
Note 5: The method of optical measurement:



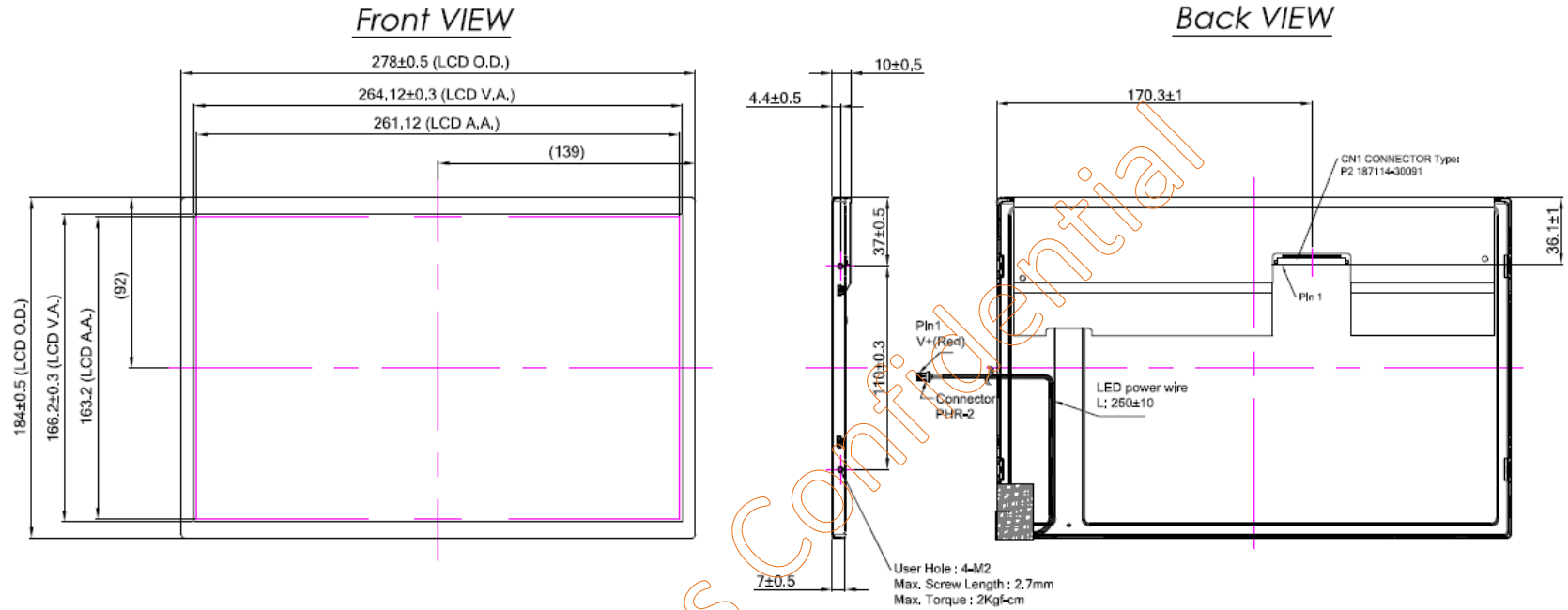
Note 6: Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

$$\delta W = \text{Maximum [L (1), L (2), L (3), L (4) \sim L (9)]} / \text{Minimum [L (1), L (2), L (3), L (4) \sim L (9)]}$$



8. DIMENSION AND DRAWING




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NOTES:

- 1.General tolerance are ±0.5mm
- 2.ROHS complied

CN1 Pin Define					
NO.	Pin Define	NO.	Pin Define	NO.	Pin Define
1	NC	11	GND	21	GND
2	NC	12	GND	22	RxCLK-
3	NC	13	Rx0-	23	RxCLK+
4	NC	14	Rx0+	24	GND
5	NC	15	GND	25	Rx3-
6	NC	16	Rx1-	26	Rx3+
7	NC	17	Rx1+	27	GND
8	NC	18	GND	28	SEL6/8
9	VCC	19	Rx2-	29	GND
10	VCC	20	Rx2+	30	NC

Customer Approval	Part Number	# REV	FLC-121HML6000SA1	#00	
Date	Rev. No.	Drawn	Description		
Company					
Name					
Signature	Date	Design By	Drawn	Check By	Approved By
	20210407				

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.