TFT Module Specification

MODEL: 13-121GMLC00H0-S

< ◇ > PRELIMINARY SPECIFICATION

< ◆ > APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
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RECORD OF REVISION

Version	Revised Date	Page	Content
V1.0	2014/03/28	--	PRELIMINARY SPECIFICATION
V1.1	2014/06/25	25	Update 9.4 INCOMING INSPECTION STANDARDS
V1.2	2014/06/26	6,15	1. Update power supply current 2. Modify signal name VCC→VDD
V1.3	2014/07/08	20	Modify Response Time and Color Chromaticity
V1.4	2014/07/09	20	Add Color Chromaticity (R,G,B)

TABLE OF CONTENTS

1. GENERAL DESCRIPTION

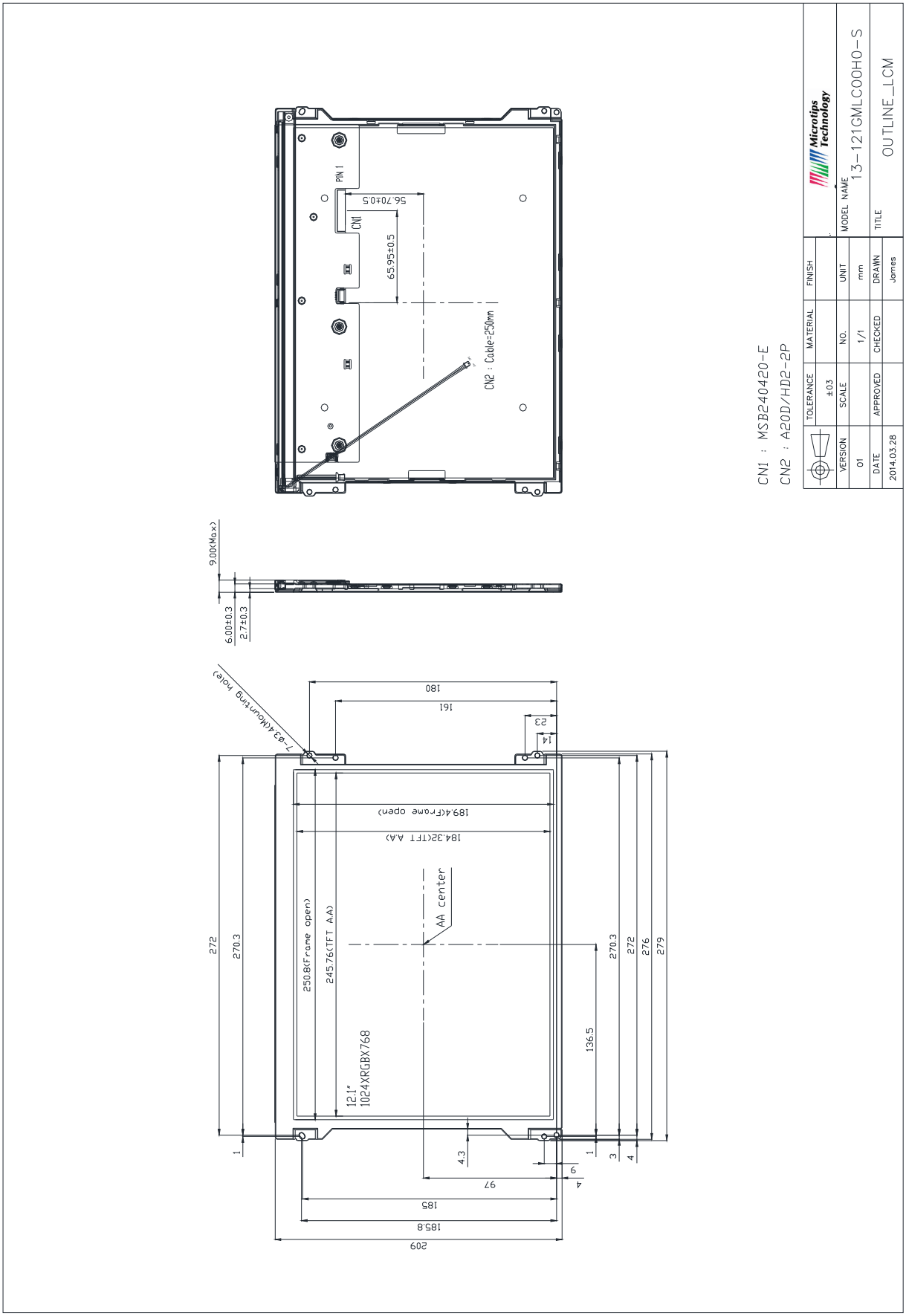
1.1 Description

The specifications is model 13-121GMLC00H0-S is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, a back light system and a projected capacitive touch panel. This TFT LCD has a 12.1 (4:3) inch diagonally measured active display area with XGA (1024 horizontal by 768 vertical pixels) resolution.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	12.1”	Inch
2	Number of Pixels	1024 (W) x RGB x 768 (H)	Pixels
3	Active Area	245.76 (W) × 184.32 (H)	mm
4	Pixel Pitch	0.240 (W) x 0.240 (H)	mm
5	Outline Dimension	279 (W) × 209 (H) × 9 (T)	mm
6	Number of Colors	262K/16.2M	- -
7	Display Mode	TN / Normally White / Transmissive	- -
8	View Direction	Wide viewing angle	- -
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Anti-glare (3H)	- -
11	Contrast Ratio	700 (Typ.)	- -
12	Luminance (cd/m^2)	1000 (Typ.)	cd/m2
13	Interface	LVDS 6/8 bit Interface	- -
14	Backlight	White LED	- -
15	Operation Temperature	-30 ~ 85	°C
16	Storage Temperature	-30 ~ 85	°C
17	Weight	(620)	g

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

3.1 TFT LCD Module(CN1)

Pin	Symbol	I/O	Function	Note
1	VDD	P	Power Supply +3.3V	
2	VDD	P	Power Supply +3.3V	
3	GND	P	Ground	
4	SEL68	I	LVDS 6/8 bit select function control, Low or NC → 6 bit Input Mode High → 8 bit Input Mode	
5	RIN0-	I	LVDS receiver signal channel 0 LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)	
6	RIN0+	I		
7	GND	P	Ground	
8	RIN1-	I	LVDS receiver signal channel 1 LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)	
9	RIN1+	I		
10	GND	P	Ground	
11	RIN2-	I	LVDS receiver signal channel 2 LVDS Differential Data Input (B2, B3, B4, B5, HS, VS, DE)	
12	RIN2+	I		
13	GND	P	Ground	
14	CLKIN-	I	LVDS receiver signal clock	
15	CLKIN+	I		
16	GND	P	Ground	
17	RIN3-	I	LVDS receiver signal channel 3, NC for 6 bit LVDS Input. LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV)	
18	RIN3+	I		
19	RSV	I	Reverse Scan Function [H: Enable; L/NC: Disable]	
20	NC	-	Please treat it as NC.	

Note 1: Input Signals shall be in low status when VDD is off

Note 2: High stands for “3.3V”, Low stands for “0V”, NC stands for “No Connection”.

Note 3: If 6 bits mode, please keep the Pin 17 & Pin 18 NC or make sure that the voltage of Pin 17 is always higher than the Voltage of Pin 18.

Note 4: Connector Model STM MSB240420-E or compatible

3.2 Backlight Unit

Pin No.	Symbol	Function	Remark
1	LEDA	Power Supply for LED backlight	RED
2	LEDK	GND for LED backlight	BLACK

Note 4: Connector Model A20D/HD2-2P or compatible,
Mating Model: S2B-PH-SM4-TB or compatible

4. ABSOLUTE MAXIMUM RATINGS

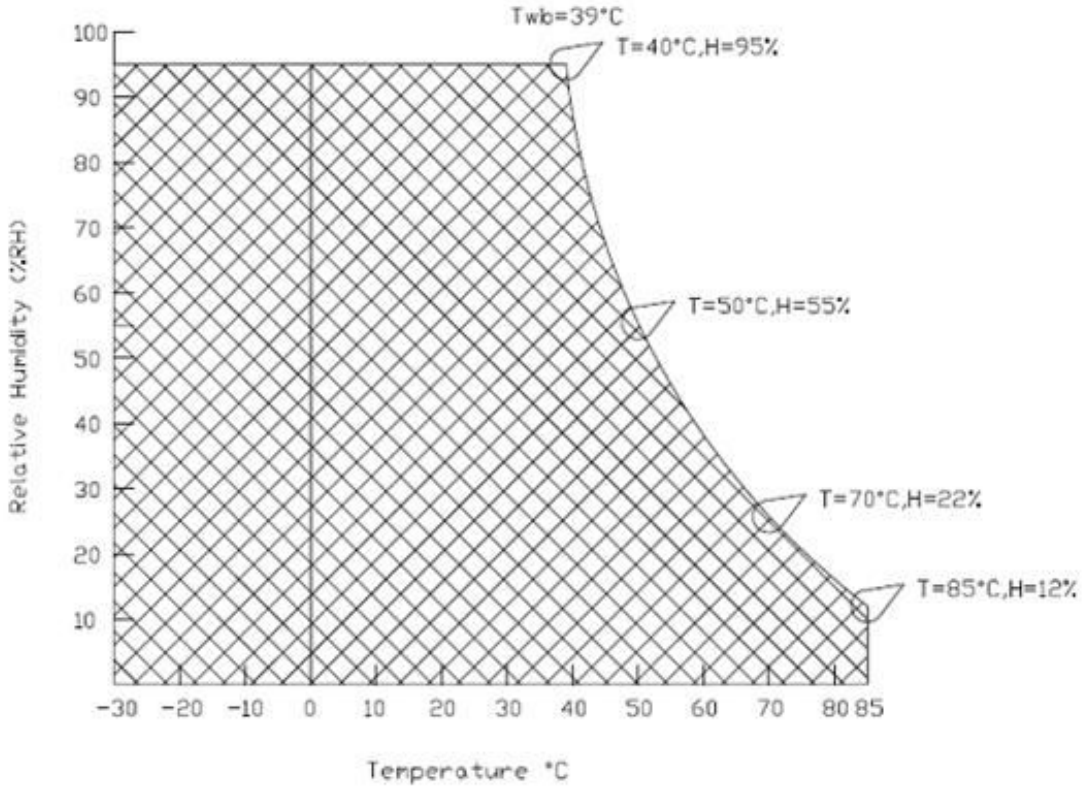
4.1 Electrical Absolute Rating

4.1.1 TFT LCD Module

Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VDD	-0.3	+3.6	V	

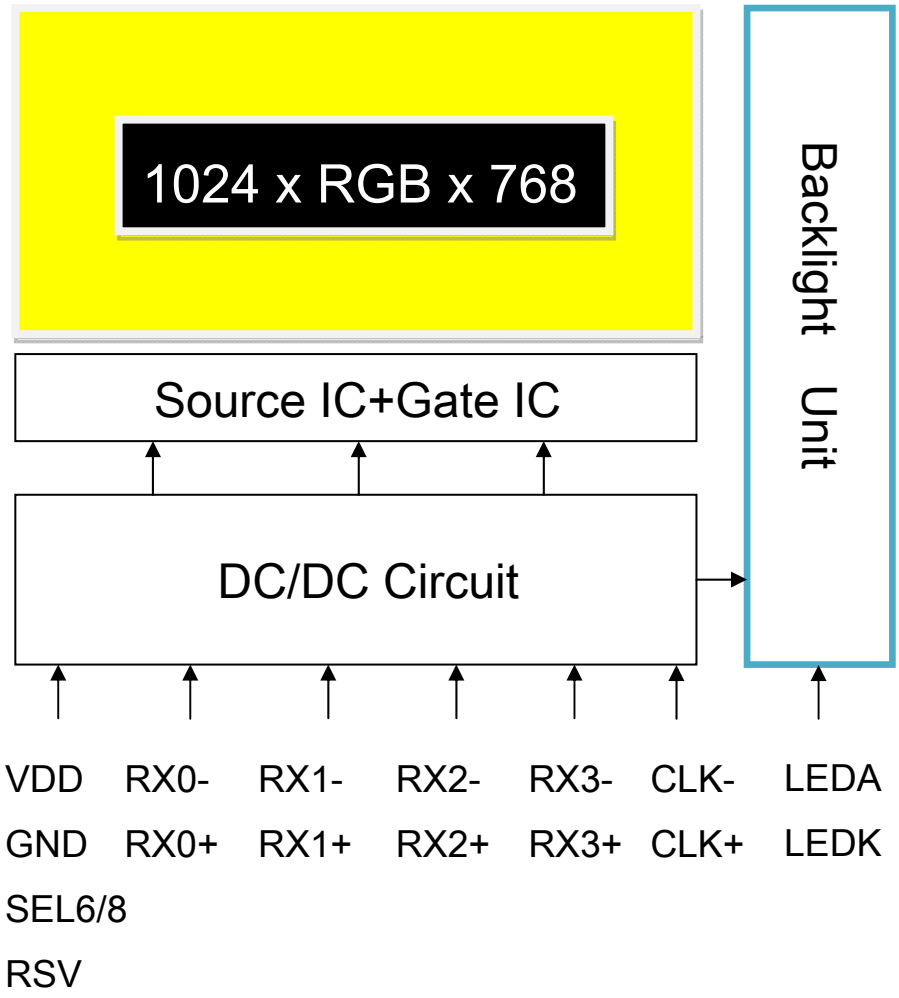
4.1.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-30		85	°C	Ambient temperature
Storage Temperature	Tstg	-30		85	°C	



5. BLOCK DIAGRAM

5.1 TFT LCD Module



6. Relationship Between Displayed Color and Input

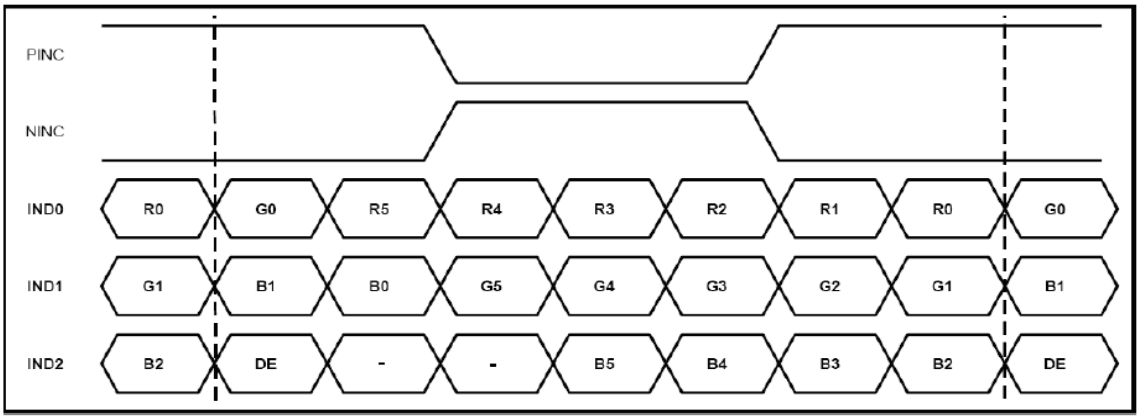
6.1 6 bit

	Color & Gray Scale	Data Signal																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

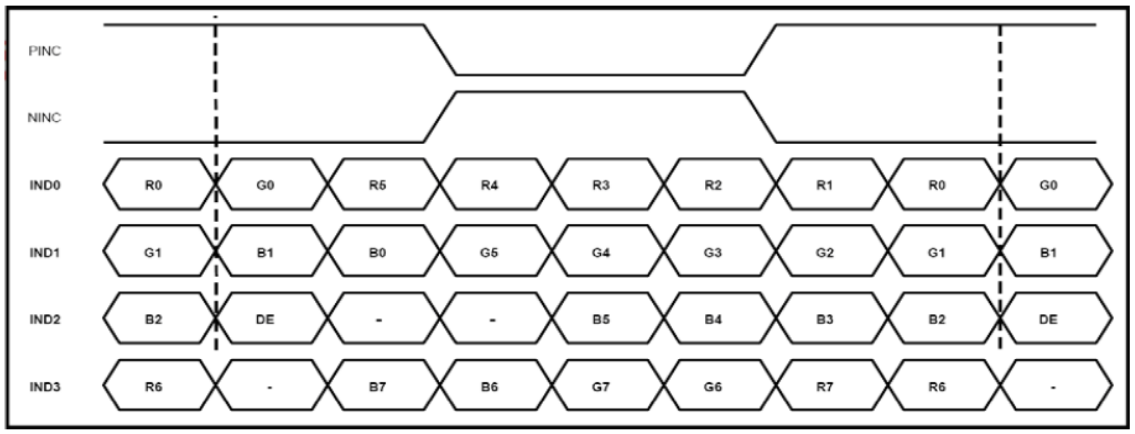
6.2 8 bit

	Color & Gray Scale	Data Signal																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(127)	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(127)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

6.3 Data Mapping



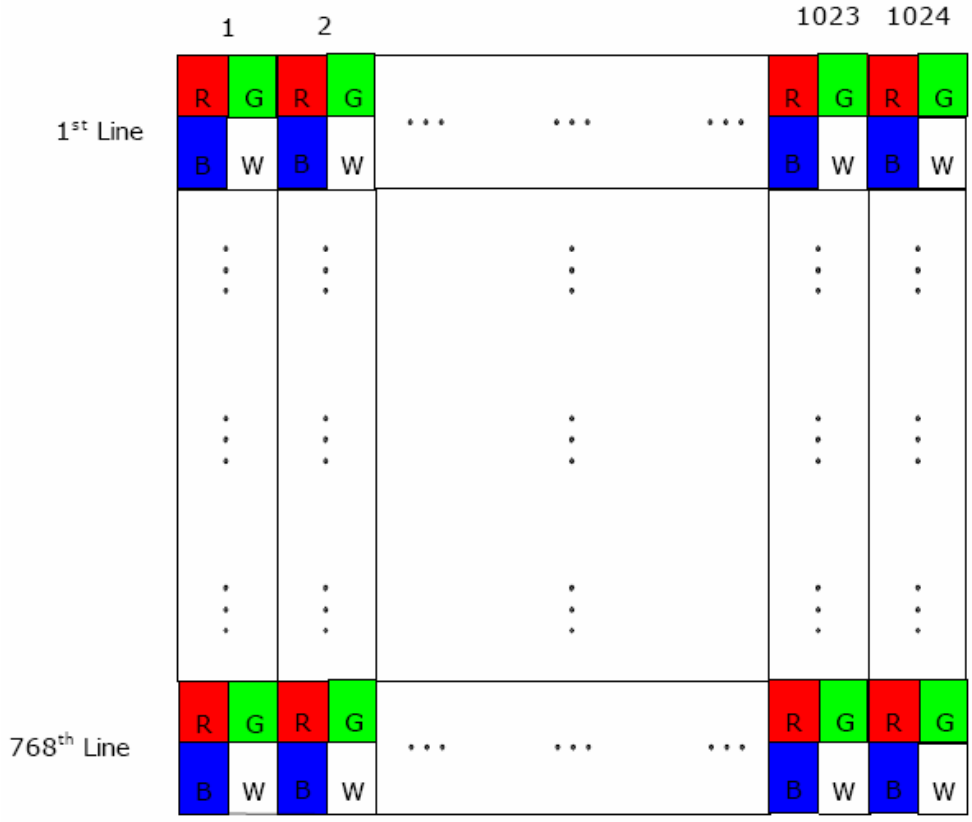
6bit LVDS input



8bit LVDS input

Signal Name	Description	
+RED5(R5) +RED4(R4) +RED3(R3) +RED2(R2) +RED1(R1) +RED0(R0)	Red Data 5 (MSB) Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB) Red-pixel Data	Red-pixel Data Each red pixel's brightness data consists of these 6 bits pixel data.
+GREEN5(G5) +GREEN4(G4) +GREEN3(G3) +GREEN2(G2) +GREEN1(G1) +GREEN0(G0)	Green Data 5 (MSB) Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0 (LSB) Green-pixel Data	Green-pixel Data Each green pixel's brightness data consists of these 6 bits pixel data.
+BLUE5(B5) +BLUE4(B4) +BLUE3(B3) +BLUE2(B2) +BLUE1(B1) +BLUE0(B0)	Blue Data 5 (MSB) Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB) Blue-pixel Data	Blue-pixel Data Each blue pixel's brightness data consists of these 6 bits pixel data.
CLK	Data Clock	The typical frequency is 65MHz. The signal is used to strobe the pixel data and DE signals. All pixel data shall be valid at the falling edge when the DE signal is high.
DE	Display Timing	This signal is stored at the falling edge of CLK. When the signal is high, the pixel data shall be valid to be displayed.

6.4 Pixel Format Image



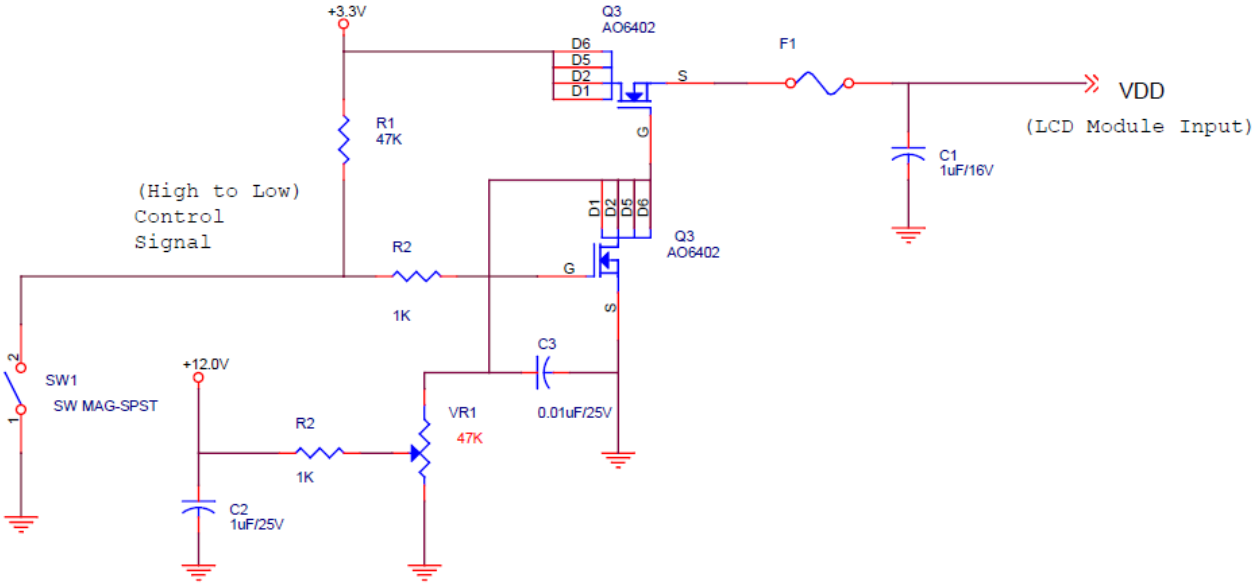
7. ELECTRICAL CHARACTERISTICS

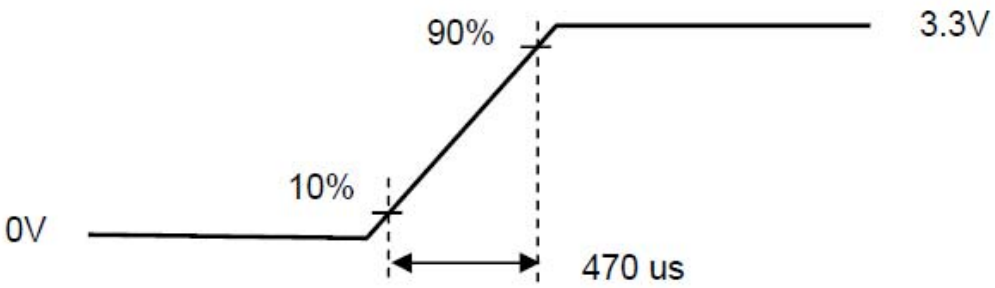
7.1 TFT LCD Module

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Power supply		VDD	3.0	3.3	3.6	V	
Rush Current		IRUSH	-	-	3	A	
Input Voltage for logic	Differential Input High Threshold	VTH			+100	mV	
	Differential Input Low Threshold	VTL	-100			mV	
Magnitude differential Input Voltage		|VID|	100	400	600	mV	
Differential input common mode voltage		VCM	1.15	1.2	1.45	V	
Power Supply current		IDD		590	710	mA	VDD=3.3V

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

Note 2: Measurement Conditions:

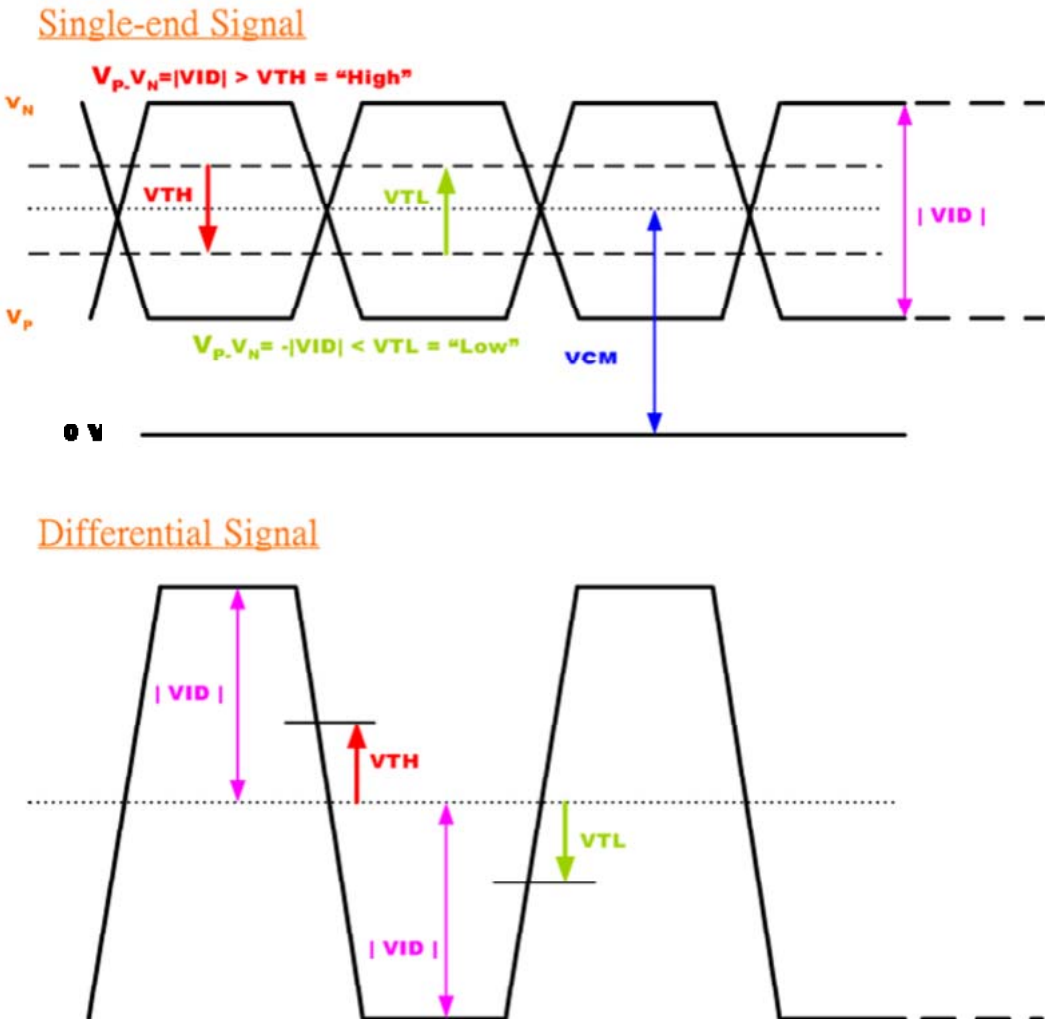




VDD rising time

Note 3: The specified power supply current is under the conditions at VDD = 3.3 V or 5V, Ta = 25 ± 2 °C, fv= 60 Hz, whereas a power dissipation check pattern below is

Note 4: LVDS Signal Waveform



7.2 Backlight Unit

Backlight Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED Forward Voltage	VF	-	18.2	-	V	
LED Forward Current	IF	-	450	-	mA	
LED Power Consumption	PF	-	8.19	-	W	
LED Life Time		30000	-	-	Hr	(1)

Note 1: The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃ 60% RH.

7.3 INTERFACE SPECIFICATIONS

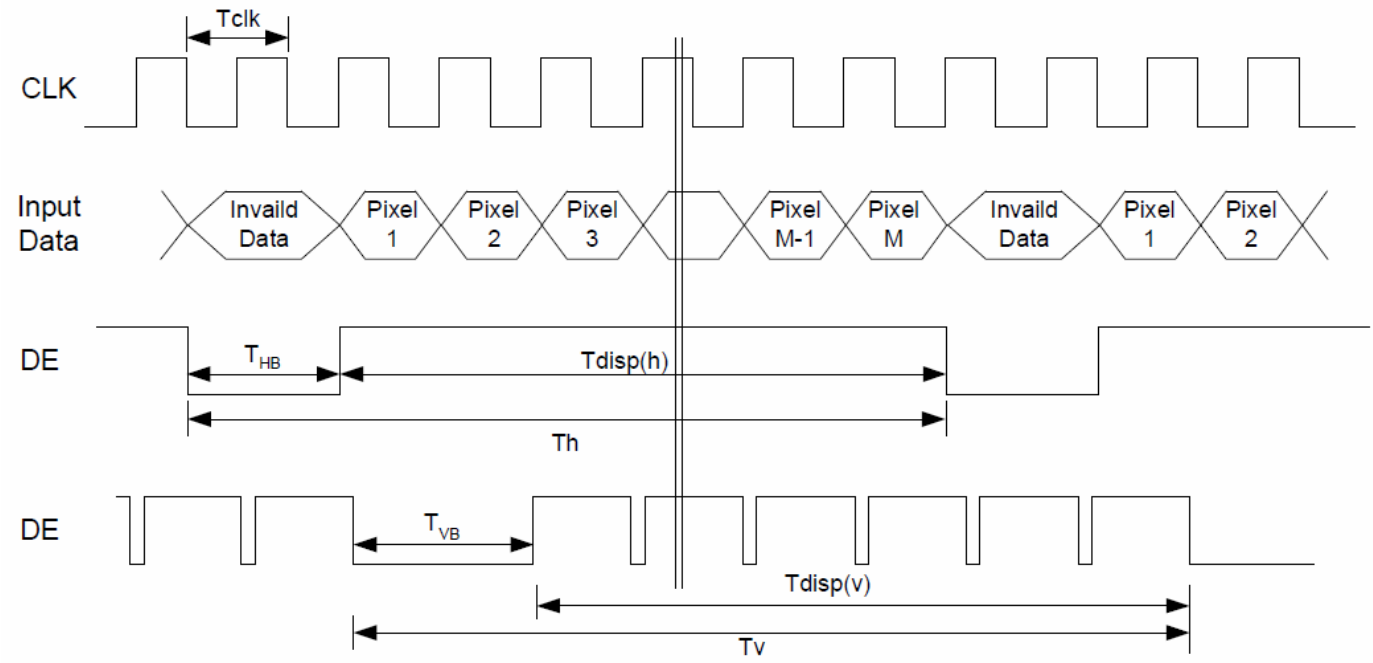
7.3.1 Timing Specifications

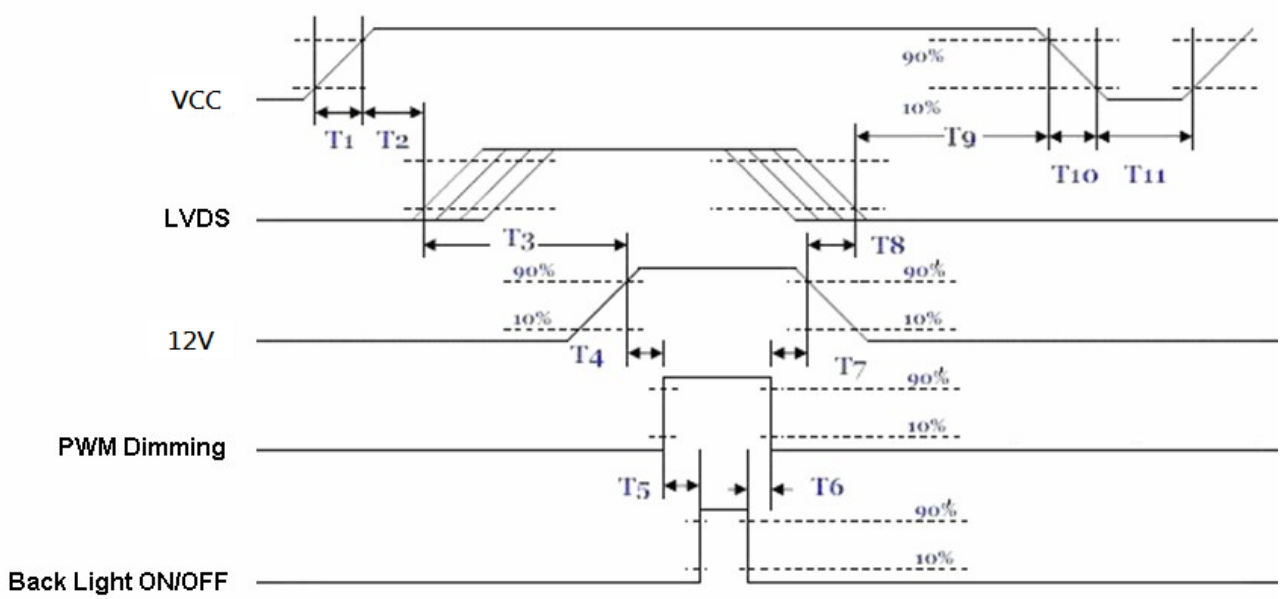
Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK	CLK frequency	Fc	50	65	80	MHz	
DE	Vertical Total Time	Tv	776	806	1023	Th	
	Vertical Addressing Time	Tvd	768	768	768	Th	
	Vertical Blank	Tvb	8	38	255	Th	
	Horizontal Total Time	Th	1054	1344	2047	Tc	
	Horizontal Addressing Time	Thd	1024	1024	1024	Tc	
	Horizontal Blank	Thb	40	320	1023	Tc	

Note 1: Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

Note 2: Frame rate is 60Hz

7.3.2 Input signal timing diagram





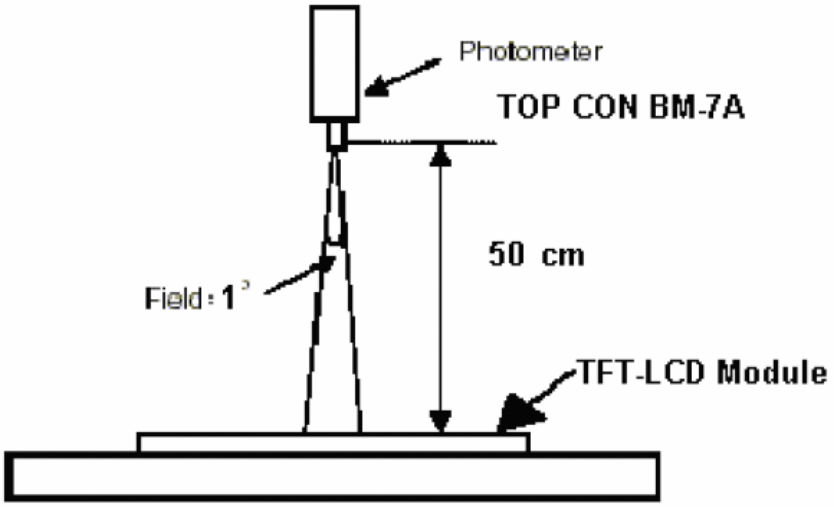
Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	200	-	-	[ms]
T4	10	-	-	[ms]
T5	10	-	-	[ms]
T6	0	-	-	[ms]
T7	10	-	-	[ms]
T8	100	-	-	[ms]
T9	0	16	50	[ms]
T10	-	-	10	[ms]
T11	1000	-	-	[ms]

8. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		--	Note1, Note 3, ($\theta = 0°$, Normal Viewing Angle)	800	1000	--	cd/m2
Contrast Ratio		CR		500	700	--	--
Response Time		Tr		--	25	35	ms
		Tf		--	10	20	ms
		Tr+Tf			35	55	ms
Color Chromaticity	White	Wx		0.260	0.310	0.360	--
		Wy		0.280	0.330	0.380	--
	Red	Rx		0.603	0.653	0.703	
		Ry		0.282	0.332	0.382	
	Green	Gx		0.259	0.309	0.359	
		Gy		0.584	0.634	0.684	
	Blue	Bx		0.107	0.157	0.207	
		By		0.003	0.053	0.103	
View angle	Horizontal	θ x+	Center CR≥10	70	80	--	
		θ x-		70	80	--	
	Vertical	θ Y+		70	80	--	
		θ Y-		70	80	--	

Note：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. The measurement method is shown in Note1.

Note1: The method of optical measurement:

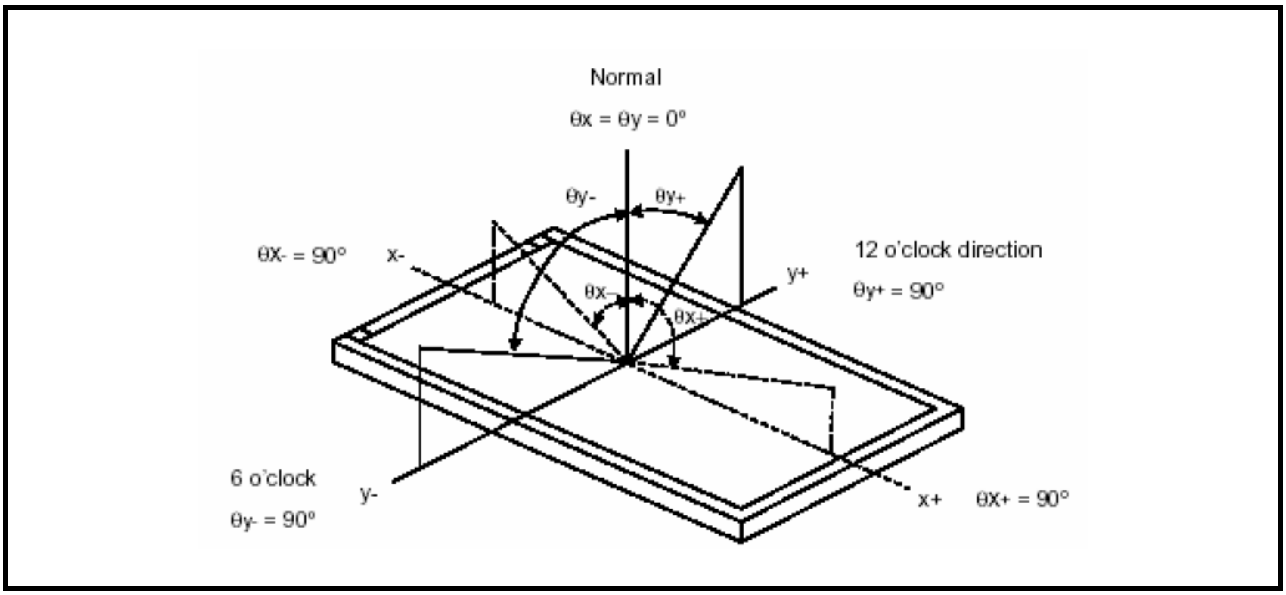


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta x = \theta y = 0^{\circ}$

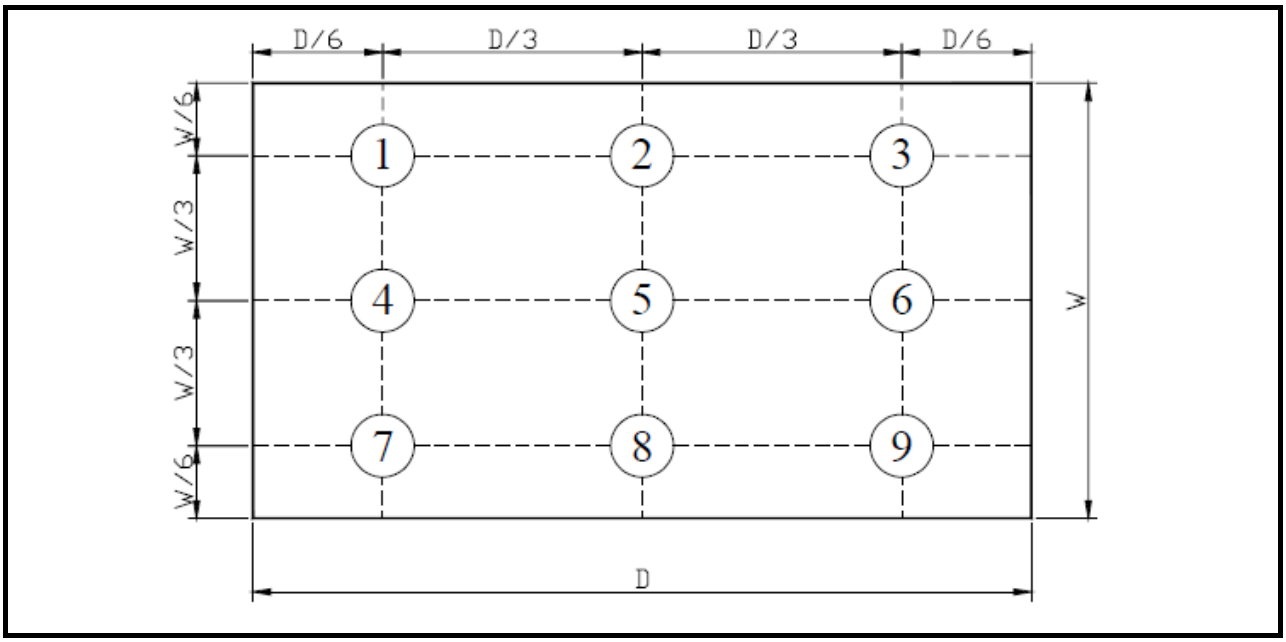
Note3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state ÷ Luminance with all pixels in Black state

Note 4: Definition of Viewing Angle:

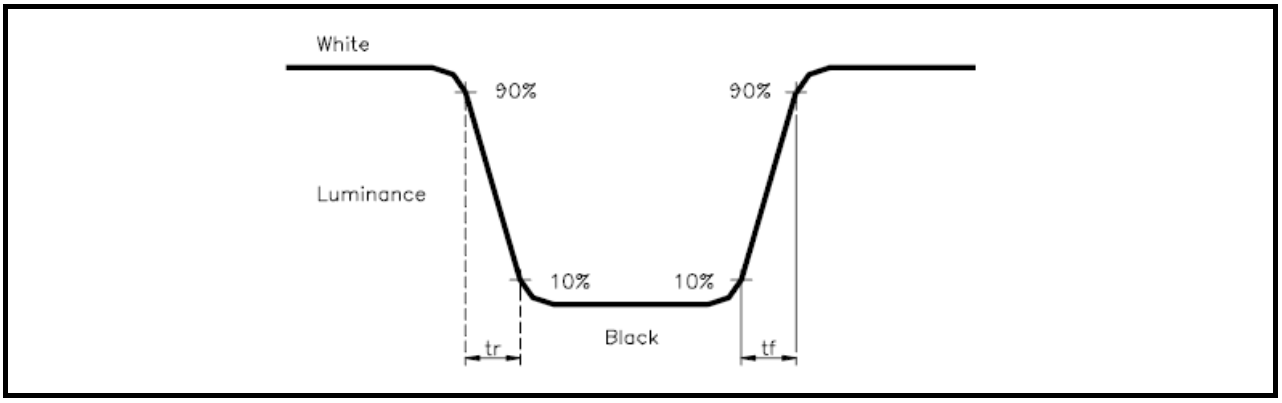


Note 5: Definition of Brightness Uniformity (B-uni):



B-uni ＝(Minimum luminance of 9 points÷Maximum luminance of 9points)X100%

Note 6: Definition of Response Time:
The Response Time is set initially by defining the “Rising Time (Tr)” and the “Falling Time (Tf)” respectively. Tr and Tf are defined as following figure



Note 7: Definition of Chromaticity:
The color coordinates (Wx,Wy),(Rx,Ry),(Gx,Gy),and (Bx,By) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

9. RELIABILITY

9.1 Test Condition

9.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

9.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

9.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

9.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

9.2 TESTS

No.	ITEM	CONDITION CRITERION
1	High Temperature Storage	85°C, 240 hrs
2	Low Temperature Storage	-30°C, 240 hrs
3	High Temperature Operating	85°C, 240 hrs
4	Low Temperature Operating	-30°C, 240 hrs
5	High Temperature/Humidity Non-Operating	40°C, 90%RH, 240 hrs
6	Temperature Shock Non-Operating	-20°C ←→ 60°C (0.5hr each), 100 cycles
7	Vibration Test Non-Operating	1.5G, (10~200Hz, Sine wave) 30 mins/axis, 3 direction (X, Y, Z)
8	Shock Test (Non-Operating)	50G, 20ms, Half-sine wave, (±X, ±Y, ±Z)
9	On/off test	On/10 sec, Off/10 sec, 30,000 cycles
10	ESD	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any touch panel function NG issue occurred.

9.3 JUDGMENT STANDARD

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

9.4 INCOMING INSPECTION STANDARDS

Inspection Item		Specification
Line defect		Can't be seen.
Bright dots		≦2 dot
Dark dots		≦3 dots
Total dots defect		≦5 dots
Continuous defect	Two continuous bright dots :	≦1 pair
	Over three continuous bright dots (vertical, horizontal, oblique) :	Not allowed
	Two continuous dark dots (vertical, horizontal, oblique) :	≦1 pair
	Over three continuous dark dots (vertical, horizontal, oblique) :	Not allowed
	Two continuous dark dots and bright dots (vertical, horizontal, oblique) :	≦1 pair
	Over three continuous dots (vertical, horizontal, oblique) :	Not allowed
	Distance between 2 Bright dots :	> 15 mm
	Distance between 2 Dark dots :	> 15 mm
	Distance between Dark dot and Bright Dot :	> 15 mm
Mura		5% ND filter

Note 1) For dot defect, one sub pixel is defined as one dot. Defect area (of dot defect) should be larger than 1/2 area of one sub-pixel to be count as 1 dot defect.
Note 2) A dot defect that is smaller than the defined dot defect will be treated as small bright dot.
The drawing of 1/2 area sub-pixel definition: The 1/2 area sub-pixel can be defined as below one or more of specific shapes. The small bright dots is less than or equal to 10 dots.

Note 3) Judgment criteria (For Bright dot and Small Bright dot) : Using ND Filter 10% (distance : 30 cm). If it could be observed, dot defines as one bright dot. If not, dot defines as one small bright dot.
Note 4) All bright dot defects should not be noticeable by observer under specified inspection environment.
Note 5) Adjacent-dot defect should be observed under the same display pattern in any one of Black/Green/Blue/Red pattern.

Definition of two continuous bright dots: Only for two continuous dots (included vertical, horizontal, oblique type)

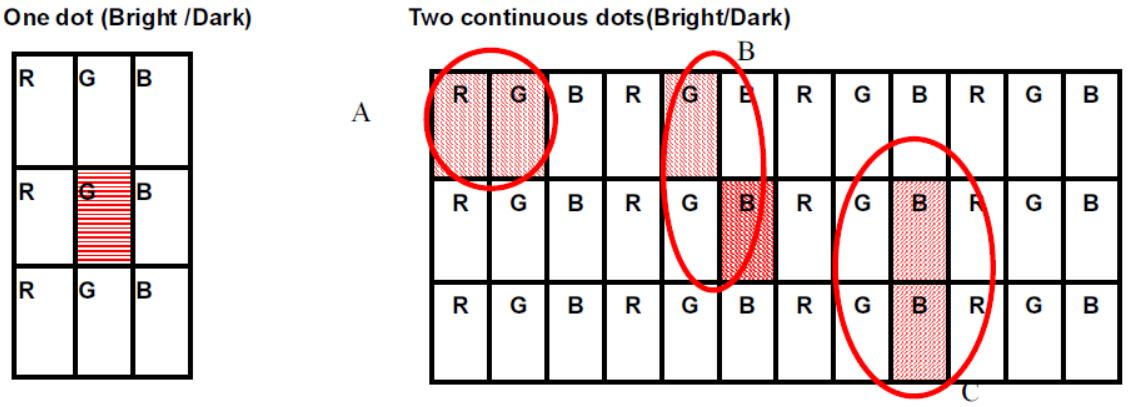
Test Pattern	Defect
Black	For bright dot(s)
Red	For bright and dark dot(s)
Green	For bright and dark dot(s)
Blue	For bright and dark dot(s)

Note 7) In three (or more) adjacent dot defect, for any 3rd dot that adjacent to 2 continuous defective dots (can be of any combination of bright dots and dark dots), the 3rd dot, no matter how large it may be, should be viewed as a dot.

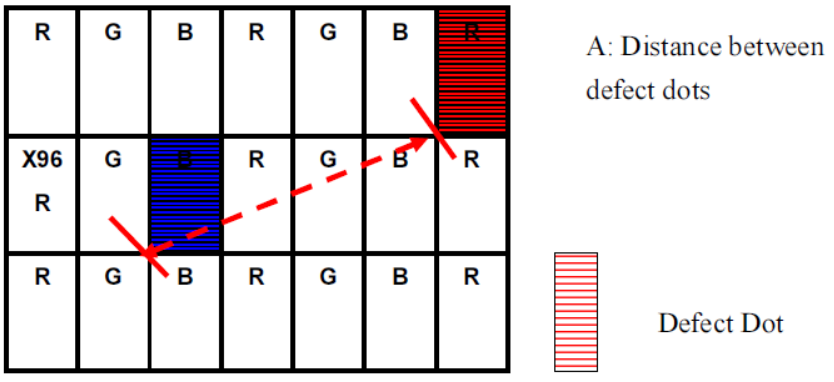
Note 8) Image Retention: 5secs Test pattern and Image sticking must be disappeared in 5 secs after pattern changed

Note 9) Defect criteria diagram

- Dot defect diagram



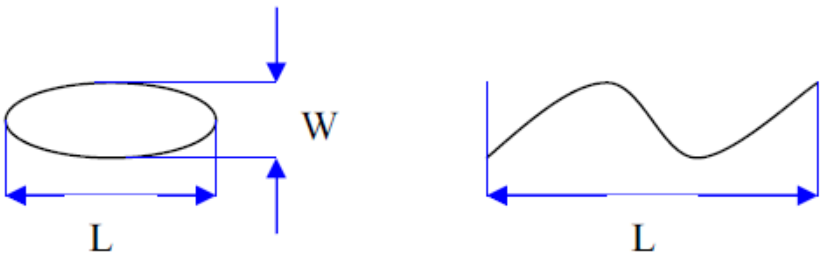
- Definition of distance between defect dots as following



Judge area	Judge item		Inspection specification			Judge criterion	
						Major	Minor
Active area	Particles, Scratch, Dent, Bubble	Circular	**Average diameter: D (mm)**		**Numbers**		○
			D<0.15		Disregarded		
			0.15≦D<0.50		n≦3		
			0.50<D		n=0		
		Linear	**Width: W (mm) Length: L (mm)**		**Numbers**		○
			W≦0.05	1<L	Disregarded		
			0.05≦W≦0.07	1≦L≦5	n≦2		
			0.07<W	L>5	n=0		
Bezel	Bezel deformation		D≦2mm		n≦2		○
	Gap between front and back bezel on all sides		W≦0.5mm				○
	Scratches, Wrap and Sunken		No harm, dangerous				○
	Assembly Fail		Not allowed			○	
	Color Difference		Allowed (No harm, dangerous)				○
Carton and Panel Label (S/N, B/L, WEEK)	No label		Not allowed			○	
	Invert label					○	
	Broken					○	
	Dirt		No larger than 30mm×20mm.			○	
	Not clear		Word can be read. Barcode can be scanned.				○
	Word out of shape						○
	Content Error		No allowed			○	
	Position		Be attached on right position				○
	Crease		No			○	
	Label overlapping		Allowed			○	
Screw	Not enough (Q'ty)		No			○	
	Loose		No			○	
Connector	Appearance		No broken, rising, deformation			○	

Note 1 : When L>=2W, defect count as liner defect.

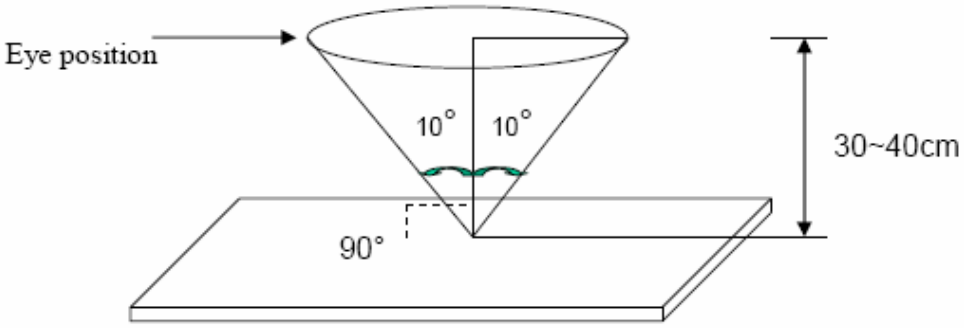
Note 2: D=1/2(W+L)



Note 3 : Extraneous substances which can be wiped out, such as fingerprint and particles are not considered as a defect.
Note 4 : Defects on the Black Matrix (outside Active Area 0.3mm) are not considered as a defect.
Note:5 :ND filter use method The inspection method of ND Filter - holding ND filter in front of the panel around 10 mm and examine the panel from 35±5 cm in the front view for 1 seconds.

9.5 Inspection environment conditions

Inspection environment conditions:
9.5.1 Room temperature : 20 ~ 25 C.
9.5.2 Humidity: 65±5% RH.
9.5.3 Illumination: Fluorescent light (Day-Light Type) display surface illumination to be 300 ~ 700 lux. (Standard 500 lux.)
9.5.4 To be a distance about 35 ± 5 cm in front of LCD unit, viewing line should be perpendicular to the surface of the module judge the visual appearance with human's eyes.
9.5.5 Take off the protector of polarizer while judging the display area.



9.6 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.
Lot size: Quantity of shipment lot per model.
Sampling type: normal inspection, single sampling
Sampling table: MIL-STD-105E
Inspection level: Level II
Acceptable quality level (AQL):
Major defect: AQL=1.0%.
Minor defect: AQL=2.5%.

10. PRECAUTION RELATING PRODUCT HANDLING

10.1 SAFETY

10.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

10.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

10.2 HANDLING

10.2.1 Avoid any strong mechanical shock which can break the glass.

10.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.

10.2.3 Do not remove the panel or frame from the module.

10.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, Do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

10.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

10.2.6 Do not touch the display area with bare hands , this will stain the display area.

10.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

10.2.8 To control temperature and time of soldering is 280 ± 10°C and 3-5 sec.

10.2.9 To avoid liquid (include organic solvent) stained on LCM.

10.3 STORAGE

10.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.

10.3.2 Do not place the module near organics solvents or corrosive gases.

10.3.3 Do not crush, shake, or jolt the module.