



Microtips

TECHNOLOGY

Model No: 13-104SMLB00D1-S

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RECORD OF REVISION

Version	Revised Date	Page	Content
V1.0	2015/12/04	--	First Issued
V1.1	2016/05/12	5	Modify drawing: LED Driver Pin direction.
V1.2	2016/06/06	4,14	1. Modify Brightness 500→450cd/m2 2. Add IVLED current.
V1.3	2016/07/22	-	Modify LED Driver Board BOM R61=100K ohm, C53=10uF/10V

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1. GENERAL DESCRIPTION

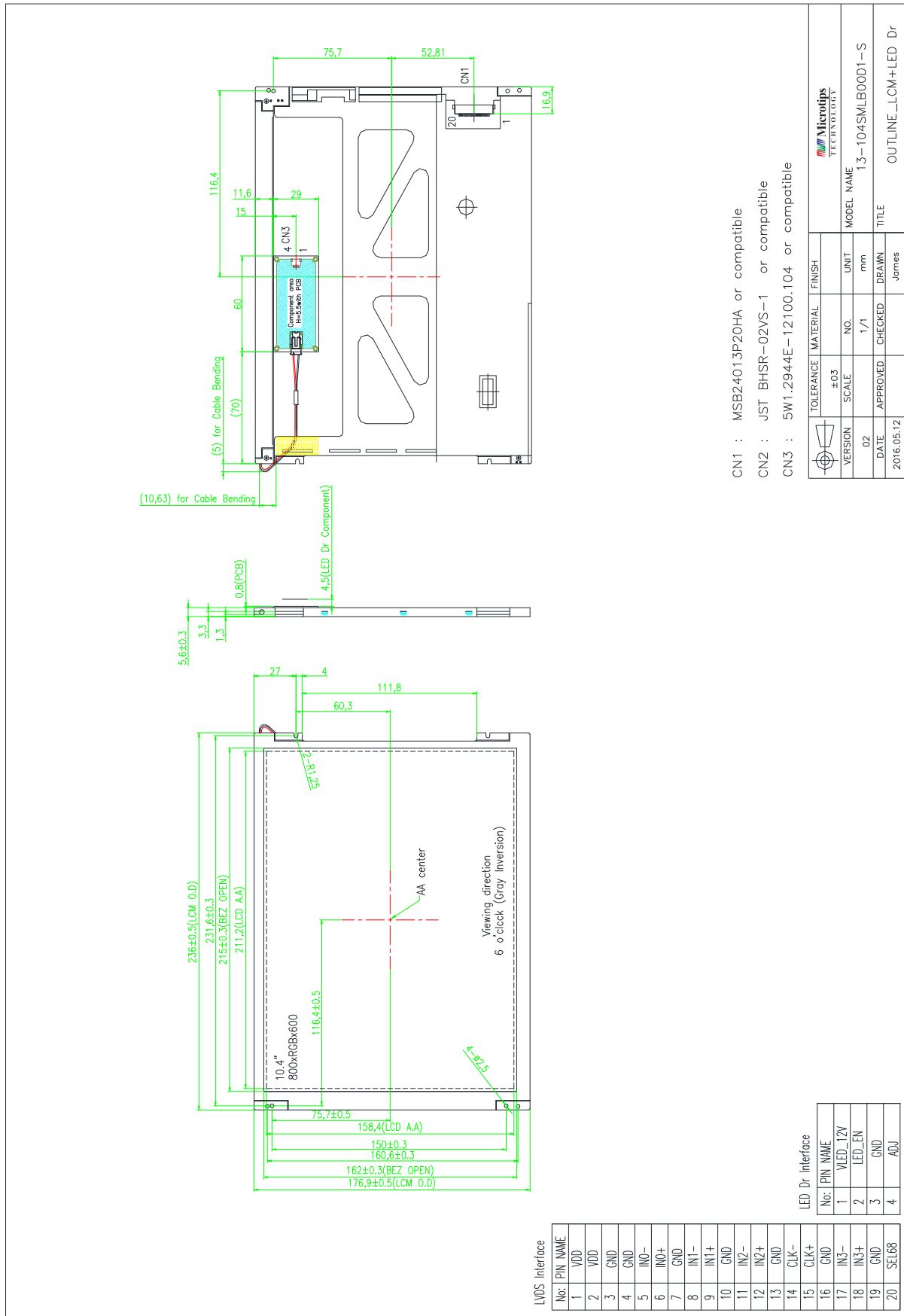
1.1 Description

The specifications is model 13-104SMLB00D1-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. This TFT LCD has an 10.4 (4:3) inch diagonally measured active display area with SVGA (800 horizontal by 600 vertical pixels) resolution.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	10.4"	Inch
2	Number of Pixels	800 (W) x RGB x 600 (H)	Pixels
3	Active Area	211.2 (W) x 158.4 (H)	mm
4	Pixel Pitch	0.264 (W) x 0.264 (H)	mm
5	Outline Dimension	236 (W) x 176.9 (H) x 5.6 (T)	mm
6	Number of Colors	262K/16.7M Dithering color	- -
7	Display Mode	TN / Normally White / Transmissive	- -
8	View Direction	6 o'clock(Gray Inversion)	
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Anti-Glare (3H)	- -
11	Contrast Ratio	800 (Typ.)	- -
12	Luminance (cd/m ²)	450 (Typ.)	cd/m2
13	Interface	LVDS 6/8 bit Interface	- -
14	Backlight	White LED	- -
15	Operation Temperature	-20 ~ 70	°C
16	Storage Temperature	-30 ~ 80	°C
17	Weight	(288)	g

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

3.1 TFT LCD Module

Pin No.	Symbol	I/O	Function	Note
1	VDD	P	Power Supply +3.3V	
2	VDD	P	Power Supply +3.3V	
3	GND	P	Ground	
4	GND	P	Ground	
5	IN0-	I	Negative LVDS differential data input	
6	IN0+	I	Positive LVDS differential data input	
7	GND	P	Ground	
8	IN1-	I	Negative LVDS differential data input	
9	IN1+	I	Positive LVDS differential data input	
10	GND	P	Ground	
11	IN2-	I	Negative LVDS differential data input	
12	IN2+	I	Positive LVDS differential data input	
13	GND	P	Ground	
14	CLK-	I	Negative LVDS differential clock input	
15	CLK+	I	Positive LVDS differential clock input	
16	GND	P	Ground	
17	IN3-	I	Negative LVDS differential data input	
18	IN3+	I	Positive LVDS differential data input	
19	GND	P	Ground	
20	SEL68	I	6/8bits LVDS data input selection [H : 8bit L/NC : 6bit]	(1)

NOTE:

1. High stands for “2.7--3.3V”, Low stands for “0--0.4”.

3.2 LED Driver Board Unit

Pin No.	Symbol	Function	Note
1	VLED_12V	Power Supply for LED driver board	
2	LED_EN	Enable (5V-ON,0V-off).	
3	GND	Ground	
4	ADJ	Brightness dimming control	

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

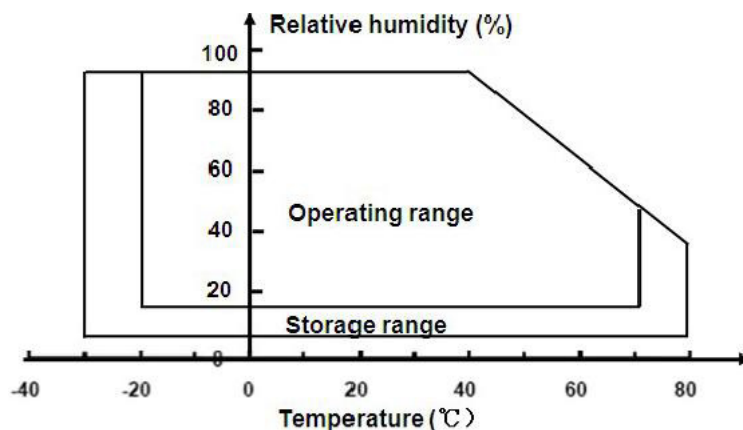
4.1.1 TFT LCD Module

Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VDD	3.0	3.6	V	

4.1.2 Environment Absolute Rating

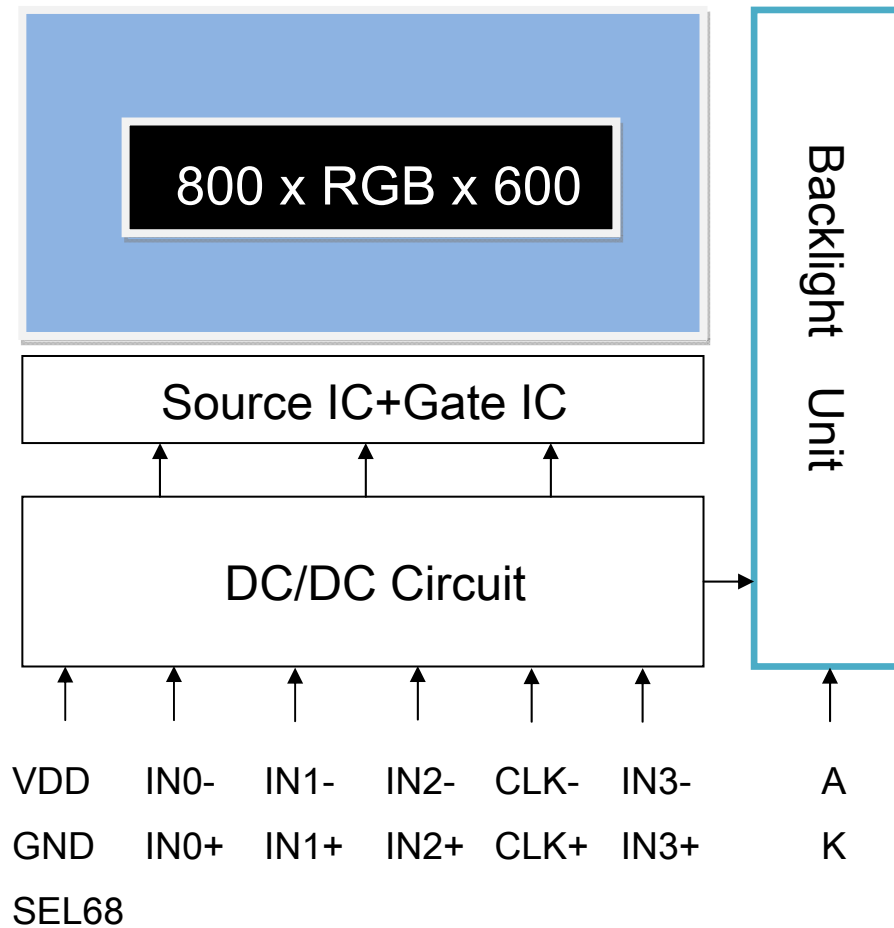
Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-20		70	°C	Ambient temperature
Storage Temperature	Tstg	-30		80	°C	

Note: Temperature and relative humidity range are shown in the Figure below. Wet bulb temperature should be 39°C max. and no condensation of water.



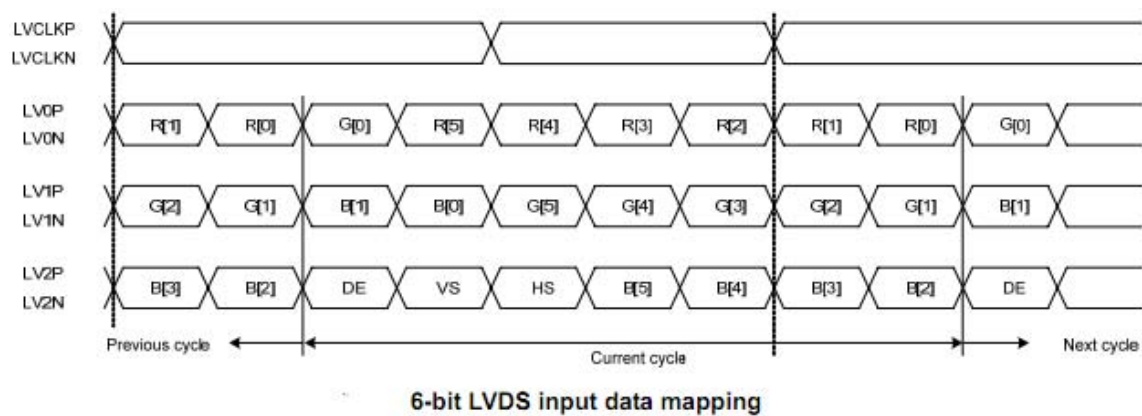
5. BLOCK DIAGRAM

5.1 TFT LCD Module

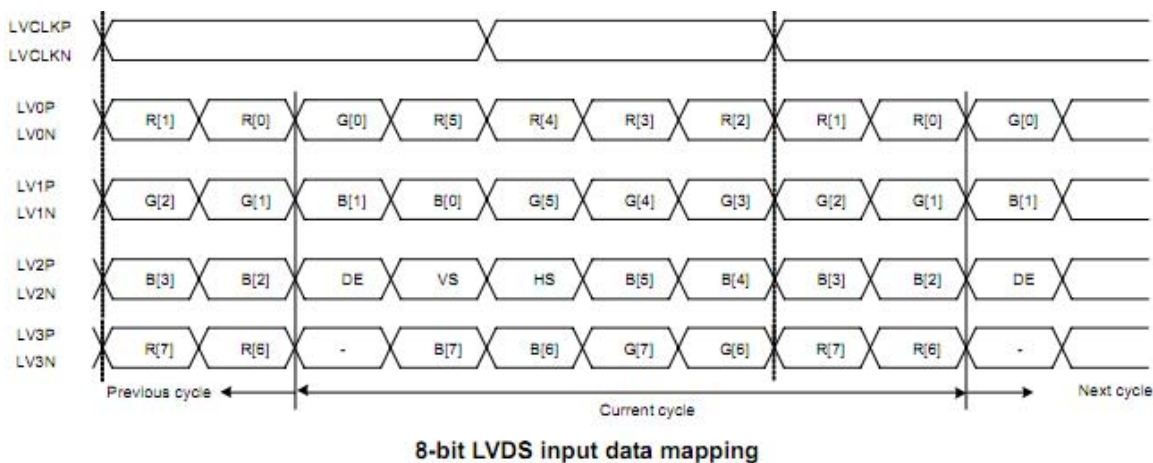


6. Relationship Between Display Color and Input

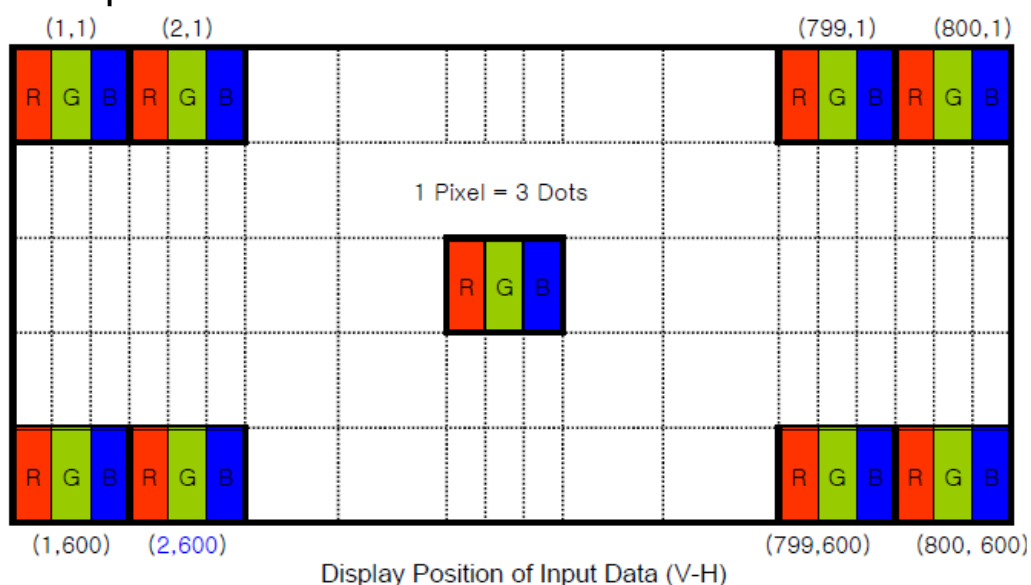
6.1 6 bit



6.2 8-bit



6.3 Data Input Format



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	
Input Voltage for logic	Differential Input High Threshold	VTH			+100	mV	
	Differential Input Low Threshold	VTL	-100			mV	
Differential input common mode voltage		VCOM	-	1.2	-	V	
Power Supply current		IDD	-	480	-	mA	

7.2 LED Driver Board Unit

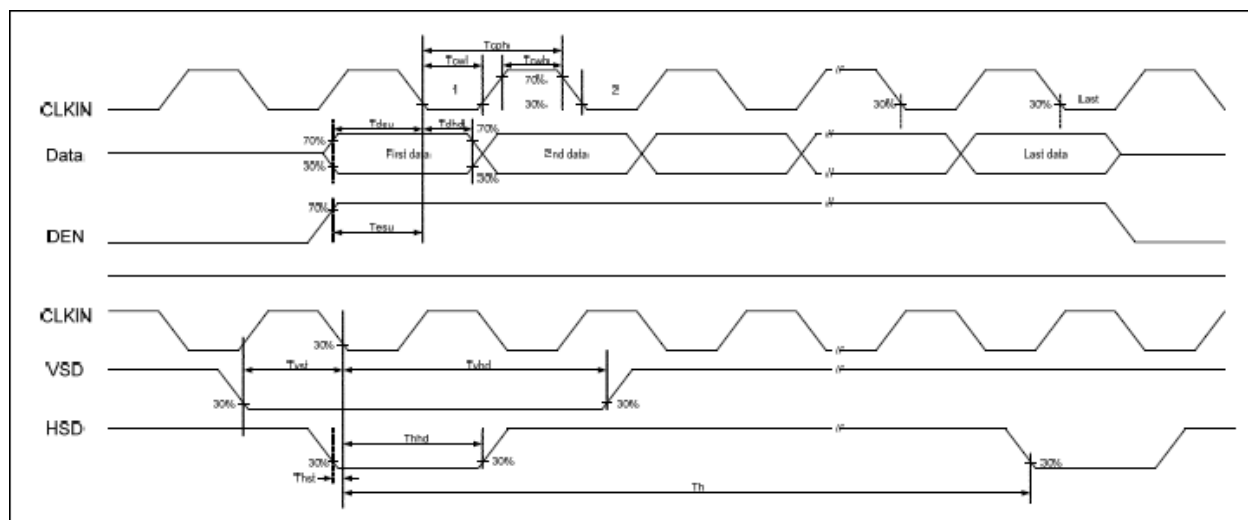
Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Driver Board Voltage	VLED	-	12	-	V	
LED Driver Board Current	IVLED	-	240	300	mA	
Power Consumption	PBL	-	2.88	-	W	
Enable Voltage	-	-	5	-	V	
Dimming Frequency	FPWM	200	-	10K	Hz	
LED Life Time (25°C)	-	50000	-	-	hr	(1)

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

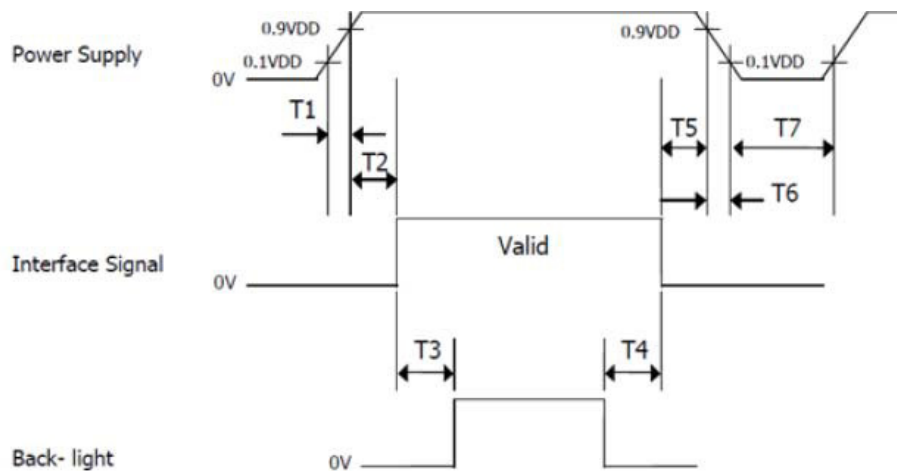
7.3 INTERFACE SPECIFICATIONS

7.3.1 Only DE Mode Input Timing Table

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK	CLK frequency	fclk	32.6	39.6	62.4	MHz	
HSYNC	HS total	Th	900	1056	1300	Tclk	
	HS Display Area	Thd	800	800	800	Tclk	
	HS Blanking	Thb+Thfp	90	200	500	Tclk	
VSYNC	VS total	Tv	610	630	800	Th	
	VS Display Area	Tvd	600	600	600	Th	
	VS blanking	Tvbp+Tvfp	10	30	200	Th	



7.4 Power On / Off Sequence



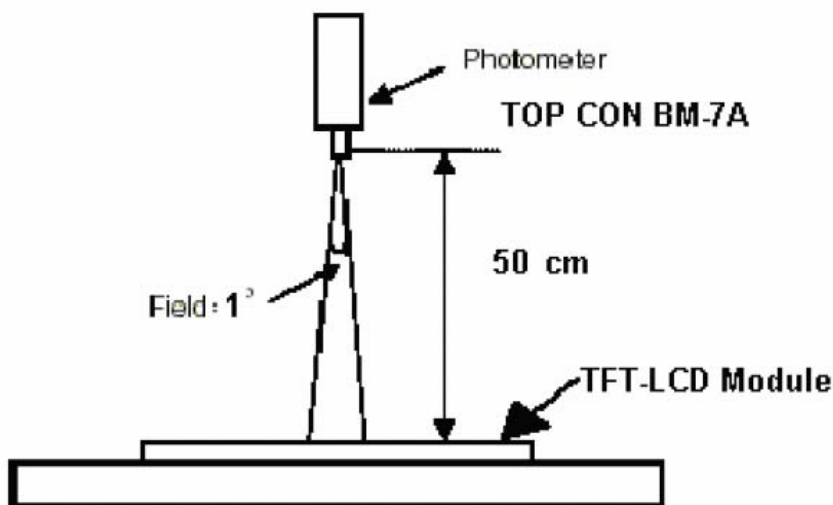
Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.5	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

8. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		--	Note1, Note 3, ($\theta = 0^{\circ}$; Normal Viewing Angle)	360	450	--	cd/m2
Uniformity		B-uni		70	80	-	%
Contrast Ratio		CR		600	800	--	--
Response Time		Tr+Tf		--	30	--	ms
Color Chromaticity	White	Wx		0.269	0.299	0.329	--
		Wy		0.309	0.339	0.369	--
	Red	Rx		0.579	0.609	0.639	
		Ry		0.305	0.335	0.365	
	Green	Gx		0.299	0.329	0.359	
		Gy		0.525	0.555	0.585	
	Blue	Bx		0.118	0.148	0.178	
		By		0.072	0.102	0.132	
View angle	Horizontal	θ x+	Center CR≥10	60	70	--	
		θ x-		60	70	--	
	Vertical	θ Y+		50	60	--	
		θ Y-		60	70	--	
NTSC					50		%

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 $25^\circ\text{C} \pm 2^\circ\text{C}$. The measurement method is shown in Note1.

Note1: The method of optical measurement:

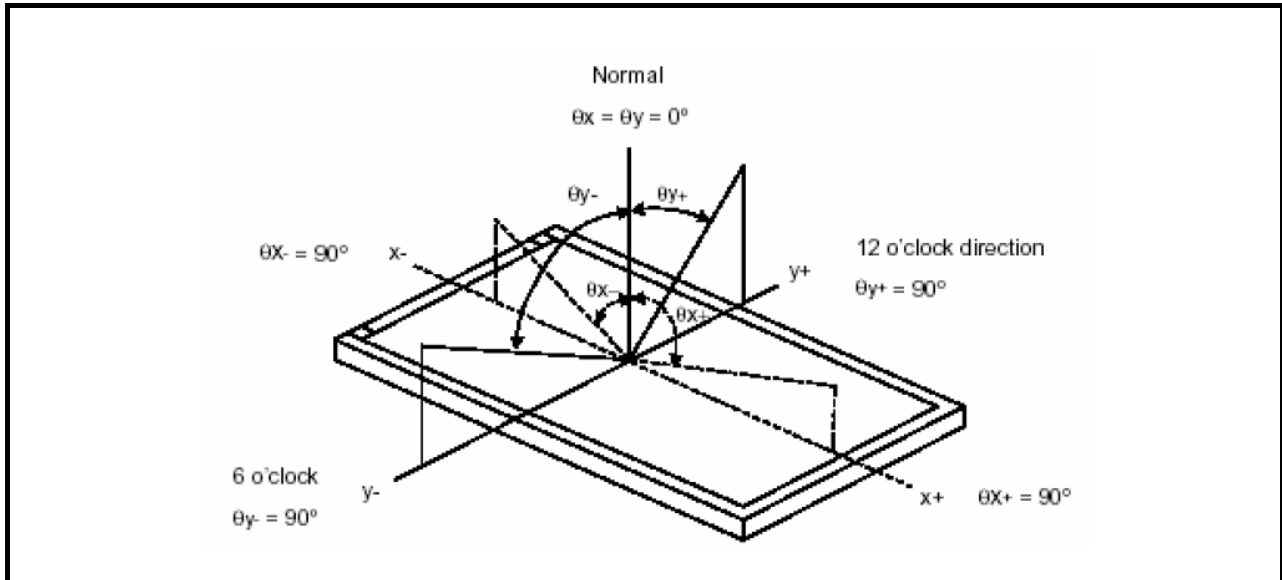


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta_x = \theta_y = 0^\circ$

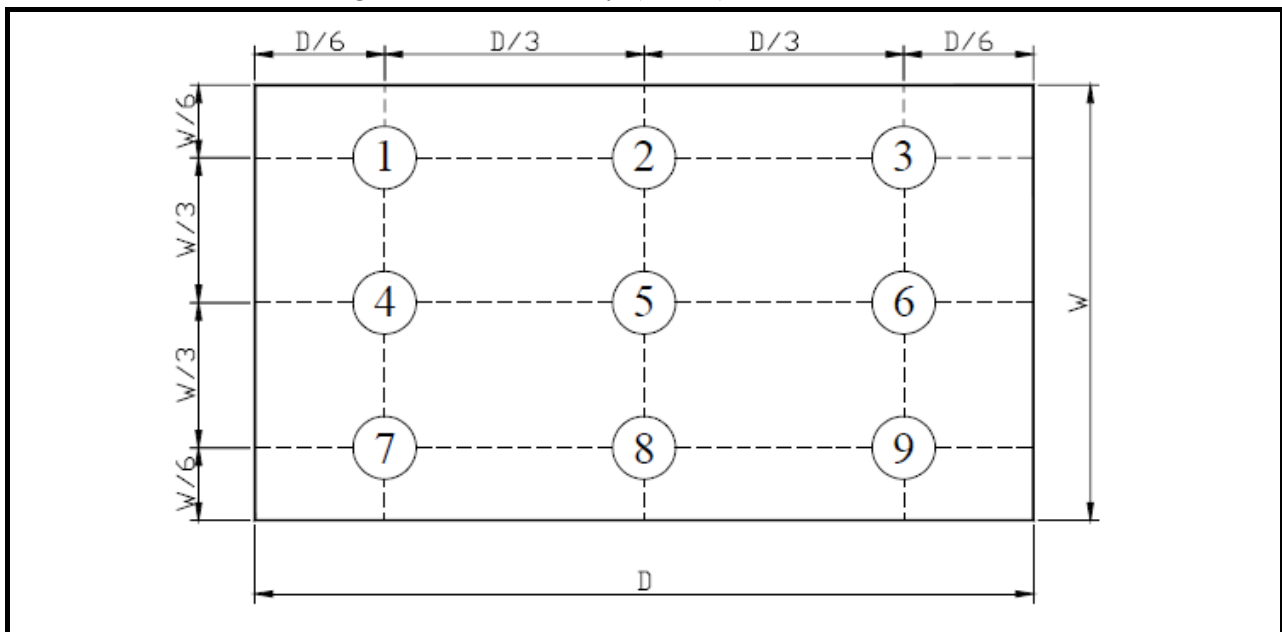
Note3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state $\div$ Luminance with all pixels in Black state

Note4: Definition of Viewing Angle:



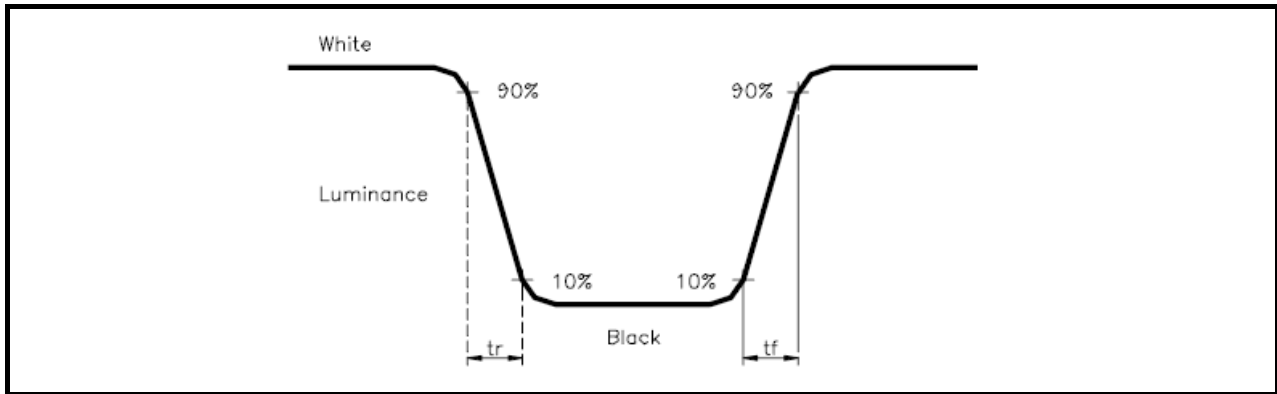
Note 5: Definition of Brightness Uniformity (B-uni):



B-uni = (Minimum luminance of 9 points $\div$ Maximum luminance of 9 points) $\times 100\%$

Note 6: Definition of Response Time:

The Response Time is set initially by defining the “Rising Time (T_r)” and the “Falling Time (T_f)” respectively. T_r and T_f are defined as following figure



Note 7: Definition of Chromaticity:

The color coordinates (W_x, W_y), (R_x, R_y), (G_x, G_y), and (B_x, B_y) 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 : $25 \pm 5^{\circ}\text{C}$

Humidity : $65 \pm 5\%$

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	80°C, 240 hrs
2	Low Temperature Storage	-30°C, 240 hrs
3	High Temperature Operating	70°C, 240 hrs
4	Low Temperature Operating	-20°C, 240 hrs
5	High Temperature/Humidity Non-Operating	60°C, 90%RH, 240 hrs
6	Temperature Shock Non-Operating	-30°C $\longleftrightarrow$ 80°C (0.5hr each), 100 hr
7	Altitude test(ALT)	25°C, 40000ft, 12Hr
8	On/Off	On 30s / Off 30s, 3000times
8	Vibration Test Non-Operating	1.5G, 10/500/10, Sine, X/Y/Z Direction
9	Electro-static Discharge Non-Operating	150pF, 330Ω Air: $\pm 8\text{KV}$; Contact: $\pm 6\text{KV}$ 20 times

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 Inspection environment conditions:

- 9.3.1 Room temperature : 20 ~ 25 C.**
- 9.3.2 Humidity: 65±5% RH.**
- 9.3.3 Illumination: Fluorescent light (Day-Light Type) display surface illumination**
- 9.3.4 display defects : 100~150 lux.**
- 9.3.5 appearance defects : 300 ~ 700 lux. (standard 500 lux)**
- 9.3.6 To be a distance about 35 ± 5 cm in front of LCD unit and view angle should be ± 40°.**
- 9.3.7 Take off the protector of polarizer while judging the display area.**
- 9.3.8 If there is any question while judging, check the panel again while operating**

9.4 INCOMING INSPECTION STANDARDS

Inspection Item	Specification	
Line defect	Can't be seen.	
Bright dots	Not allowed (note 1)	
Dark dots	≤ 3 dots	
Total dots defect	≤ 3 dots	
Continuous defect	Two continuous bright dots :	Not allowed
	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) :	Not allowed
	Distance between 2 Bright dots :	NA
	Distance between 2 Dark dots :	$\geq 15\text{mm}$
	Distance between Dark dot and Bright Dot :	NA
Image sticking	Turn on the panel and display with the test pattern (10X10 black & white, Figure 1). Keep power on for 24 hours with chessboard pattern in room temperature and then change to L127 gray pattern (Figure 2). If there is image sticking phenomenon remained, it shall invisible through 8%. ND filter.  Figure 1   Figure 2	
Mura	Not allowed	

Note 1) The bright dot can be counted as one bright dot defect.

Note 2) 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

1	2	3
4	A	5
6	7	8

type) (Fig.4)

Note 3) 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.

Defect criteria diagram

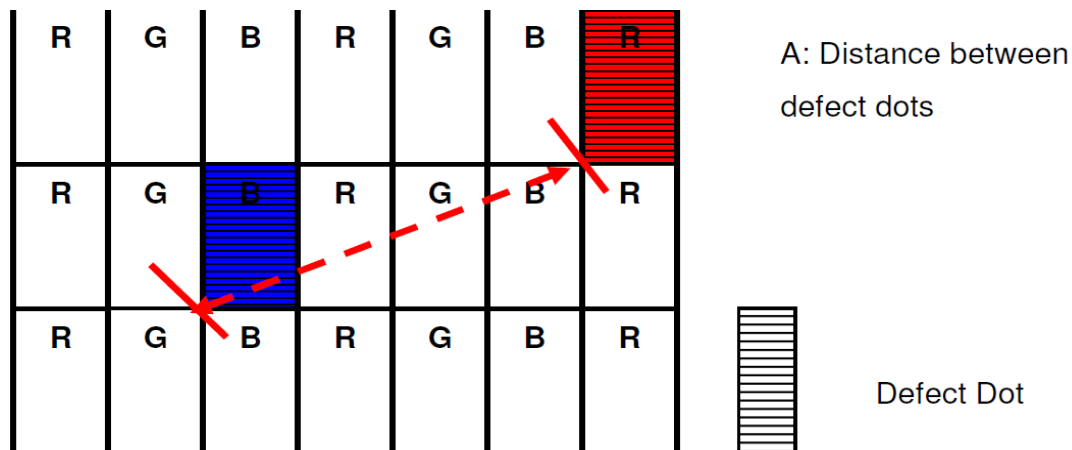
5-1) Adjacent Dot defect diagram:

5-2) Definition of distance between defect dots as following:

Adjacent-dot defect : refer to Figure 2, dot

1,2,...,8 around A are all A's adjacent dots

Fig.5



Judge area	Judge item		Inspection specification			Judge criterion		
						Major	Minor	
Active area	Particles on the polarizer	Circular	Average diameter: D (mm)		Numbers			○
			D ≤ 0.05		Disregarded			
			0.05 < D ≤ 0.25		n ≤ 4			
			0.25 < D		n = 0			
		Linear	Width: W (mm) Length: L (mm)		Numbers			○
			W ≤ 0.05		L ≤ 1.0	Disregarded		
	0.05 < W		1.0 < L	n = 0				
	Scratch/Defect on the polarizer	Circular	Average diameter: D (mm)		Numbers			○
			D ≤ 0.05		Disregarded			
			0.05 < D ≤ 0.25		n ≤ 4			
			0.50 < D		n = 0			
		Linear	Width: W (mm) Length: L (mm)		Numbers			○
			W ≤ 0.05		L ≤ 1.0	Disregarded		
	0.05 < W		1.0 < L	n = 0				
	Bubble on the polarizer	Circular	Average diameter: D (mm)		Numbers			○
			D ≤ 0.05		Disregarded			
			0.05 < D ≤ 0.25		n ≤ 4			
			0.50 < D		n = 0			
Extraneous substances	Circular	Average diameter: D (mm)		Numbers			○	
		D ≤ 0.15		Disregarded				
		0.15 < D ≤ 0.50		n ≤ 4				
		0.50 < D		n = 0				
	Linear	Width: W (mm) Length: L (mm)		Numbers			○	
		W ≤ 0.05		L ≤ 2.0	Disregarded			
			0.05 < W	2.0 < L	n = 0			

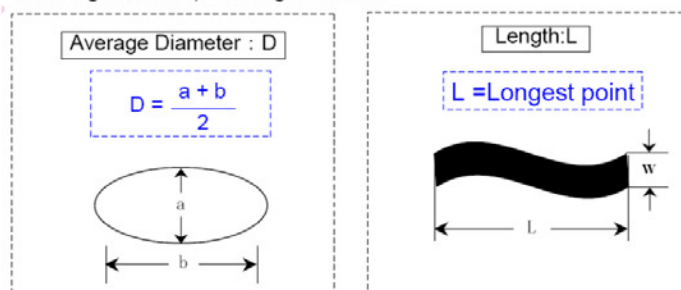
From Active area outside 0.3mm	The end of polarizer	The defect can't be seen from active area outside 0.3mm		○
Bezel	Bezel deformation	1. No sharp burr/edge to cause safety issue; 2. The bezel defect to be accepted if it is not affecting display performance, quality and mechanical property.		○
	Gap between front and back bezel on all sides			○
	Scratches, Wrap and Sunken	No harm, dangerous		○
	Assembly Fail	Not allowed	○	
Label (S/N, B/L, WEEK)	No label	Not allowed	○	
	Invert label		○	
	Content Error		○	
	Dirt	Word can be read. Barcode can be scanned.		○
	Not clear			○
	Word out of shape			○
	Broken			○
	Crease			○
	Label overlapping			○
	Position	Be attached on right position	○	
Screw	Not enough (Q'ty)	Not allowed	○	
	Loose	Not allowed	○	
Connector	Appearance	No broken, rising, deformation	○	

Note 1 : Extraneous substances which can be wiped out, such as fingerprint and particles are not considered as a defect.

Note 2 : Defects on the Black Matrix (outside Active Area 0.3mm) are not considered as a defect.

Note 3 : Defect size definition: (Unit:mm). When $L \geq 2W$, defect count as liner defect.

D: Average Diameter; L: Length W: Width



9.5 Sampling Condition

- 9.5.1 The judgement of the shipped lot (acceptance or rejection) should follow the sampling plan of ANSI/ASQL Z1.4-2003, single sampling, normal inspection, level II.**
- 9.5.2 If the number of defects is equal to or less than the applicable acceptance level, the lot shall be accepted**
- 9.5.3 If the number of defects is more than the applicable acceptance level, the lot shall be rejected and the buyer should inform the seller of the result of incoming inspection in writing.**

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 $280 \pm 10^{\circ}\text{C}$ 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 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 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.**