HANTRONIX

PRODUCT SPECIFICATION

HDA700L-3GL

7”, TFT WVGA (800X480) COLOR LCD DISPLAY MODULE

HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.: Z.W.	REV.: 1.0	HDA700L-3GL	SHEET 1 OF 23 DATE: 3/1/16

1. General Description and Features

HDA700L-3GL is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a receiver circuit, and a back-light unit. Graphics and texts can be displayed on a WVGA 800 (W) x 3 x 480 (H) dots (16:9 aspect ratio) with 262,144 colors by supplying 18 bits data signal (6bits/each color).

1.1 Features

- Transmissive and back-light with 27 LEDs are available.
- TN (Twisted Nematic) mode.
- LVDS Receiver 18 bit Interface.
- Back-light Dimming control

1.2 LCD Module

Item	Specification	Unit
Screen Size	7.0 inches	Diagonal
Display Resolution	800 (H) x 480 (V)	Pixel
Active Area	153.6 (H) x 86.64 (V)	mm
Outline Dimension	165.00 (H) x 104.00 (V) x 5.4 (T)	mm
Display Mode	Normally white mode/ Transmissive	--
Surface Treatment	Anti-glare(AG)	--
Pixel Arrangement	R,G,B Vertical Stripe	--
Pixel Size	192 x 180.5	um
Display Color	262k	--
Viewing Direction	6 o'clock	--
Input Interface	LVDS Receiver 18 bit Interface	--

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	165.00	--	mm	
	Vertical (V)	--	104.00	--	mm	
	Thickness (T)	--	5.4	--	mm	(1)
Weight		--	(150)	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

3. Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	80	°C	(1)
Operating temperature	T_{OPR}	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. (40 °C ≥ Ta). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.

Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.1.2 Electrical Absolute Maximum Ratings

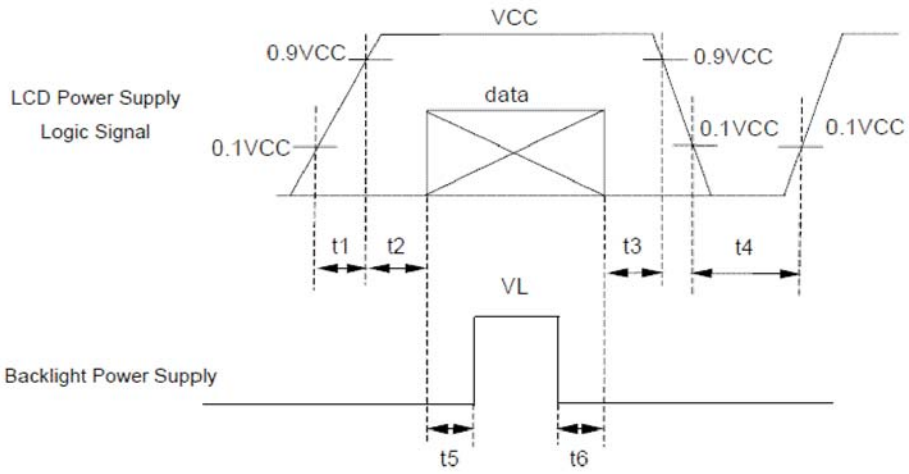
(V_{SS}=GND=0)

Parameter	Symbol	Min.	Max.	Unit	Remark
Power supply Logic voltage	VCC	-0.3	4.0	V	
Power supply LED voltage	VLED	-0.3	6.0	V	
Permissive input ripple voltage	V_{RF}	--	100	mVp-p	V_{CC}=+3.0V

Display On/Off Sequence :

t1 ≤ 10 ms
0 < t2 ≤ 50 ms
0 < t3 ≤ 50 ms

200 ms ≤ t4
200 ms ≤ t5
0 ≤ t6



3.1.3 DC Electrical Characteristics of the TFT LCD

(Ta=25±2°C, V_{SS}=GND=0)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply Logic Voltage		VCC	3.0	3.3	3.6	V	
Power supply LED Voltage		VLED	4.5	5	5.5	V	
Input Voltage for logic	H Level	VIH	0.7xVCC	-	VCC	V	
	L Level	VIL	0	-	0.3xVCC	V	
Power Supply current		ICC	-	(170)	-	mA	Note 1
Power Supply current		ILED	-	450	600	mA	
LED Life time		-	(20000)	-	-	Hr	Note 2

Note1: fv =60Hz , Ta=25°C , Display pattern : Black pattern

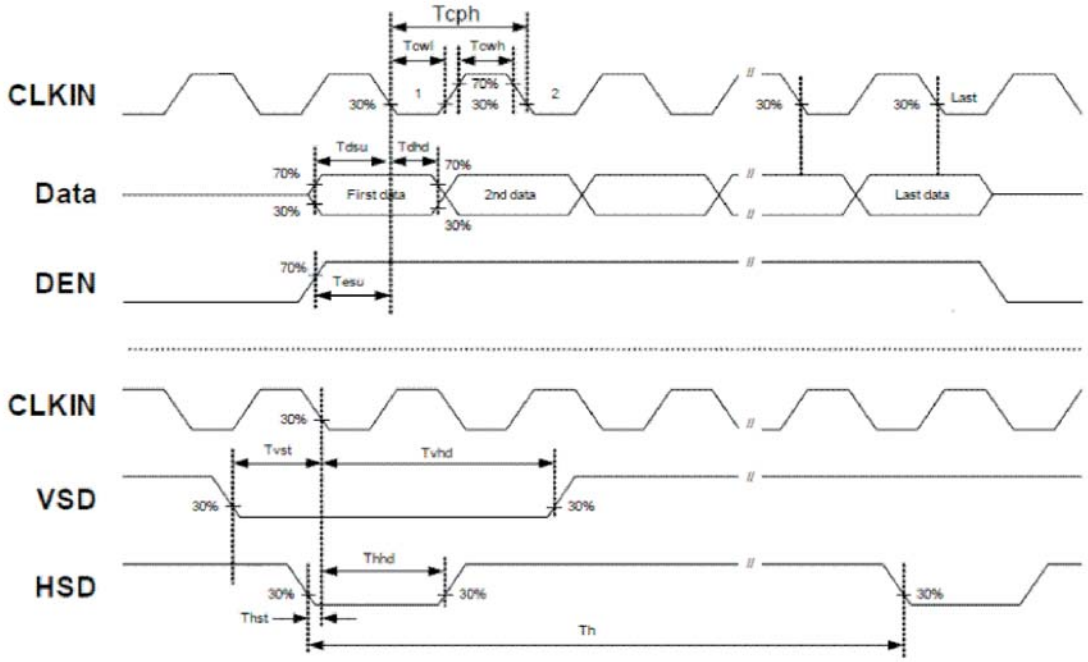
Note2: The environmental conducted under ambient air flow ,at Ta=25±2°C,60%RH±5%

3.1.4 Timing Condition (DE only mode)

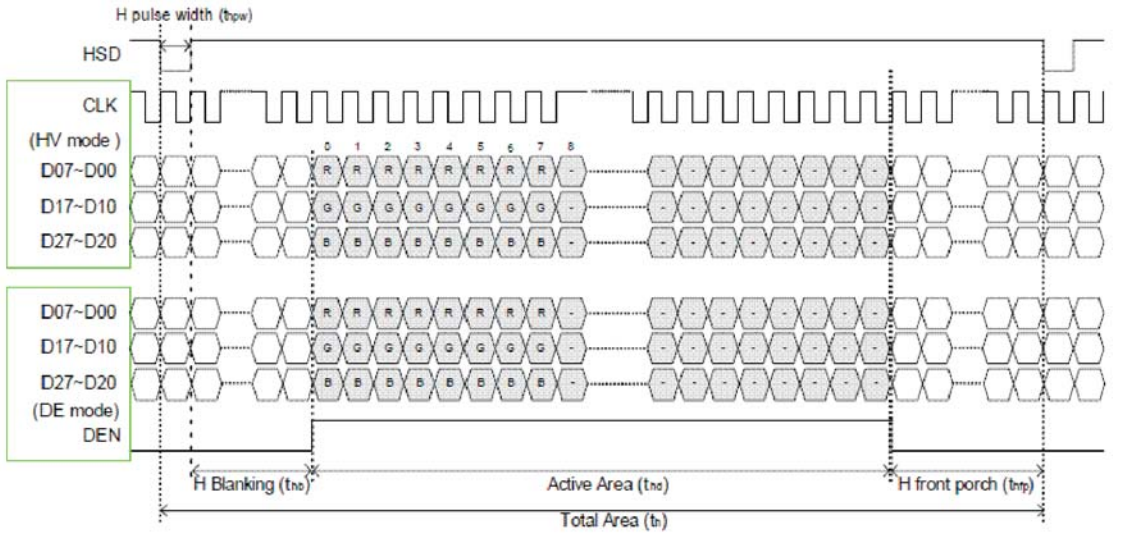
Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	DCLK cycle time	T_{cph}	25	-	-	ns	
	DCLK Frequency	f_{clk}	-	30	40	MHz	
	DCLK High plus width	T_{cwh}	40	50	60	%	
Horizontal	HSD setup time	T_{hst}	8	-	-	ns	
	HSD hold time	T_{hhd}	8	-	-	ns	
	Horizontal display area	t_{hd}	-	800	-	Tcph	
	HSD period time	th	-	928	-	Tcph	
	HSD pulse width	t_{hpw}	1	48	-	Tcph	
	HSD back porch	t_{hb}	-	40	-	Tcph	
	HSD front porch	t_{hfp}	-	40	-	Tcph	
Vertical	VSD setup time	T_{vst}	8	-	-	ns	
	VSD hold time	T_{vhd}	8	-	-	ns	
	Vertical display area	t_{vd}	-	480	-	th	
	VSD period time	t_{v}	-	525	-	th	
	VSD pulse width	t_{vpw}	-	3	-	th	
	VSD back porch	t_{vb}	-	29	-	th	
	VSD front porch	t_{vfp}	-	13	-	th	
DE	DE setup time	T_{esu}	8	-	-	ns	
	DE hold time	T_{ehd}	8	-	-	ns	
DATA	Data setup time	T_{dsu}	8	-	-	ns	
	Data hold time	T_{dhd}	8	-	-	ns	

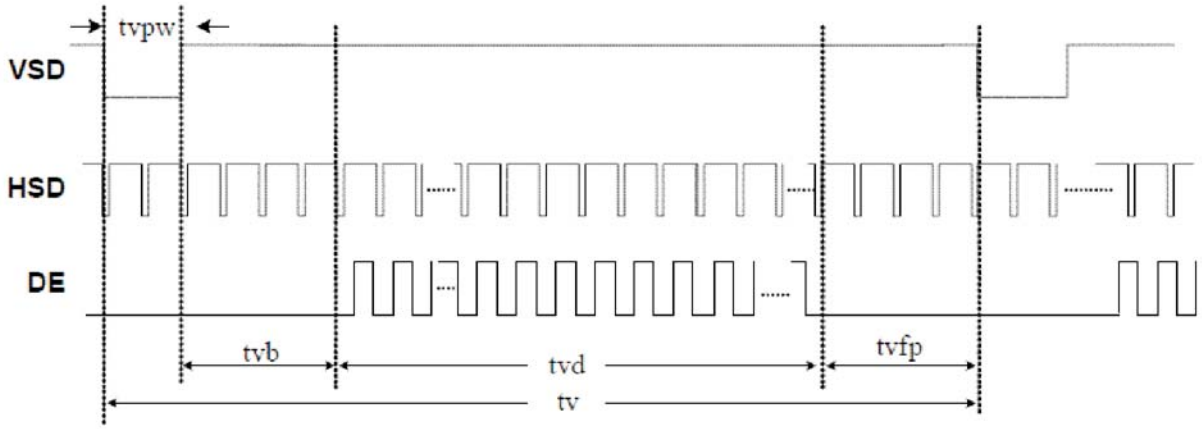
3.1.5 Timing Characteristic

3.1.5.1 DE and RGB Input Timing



Sampling clock timing





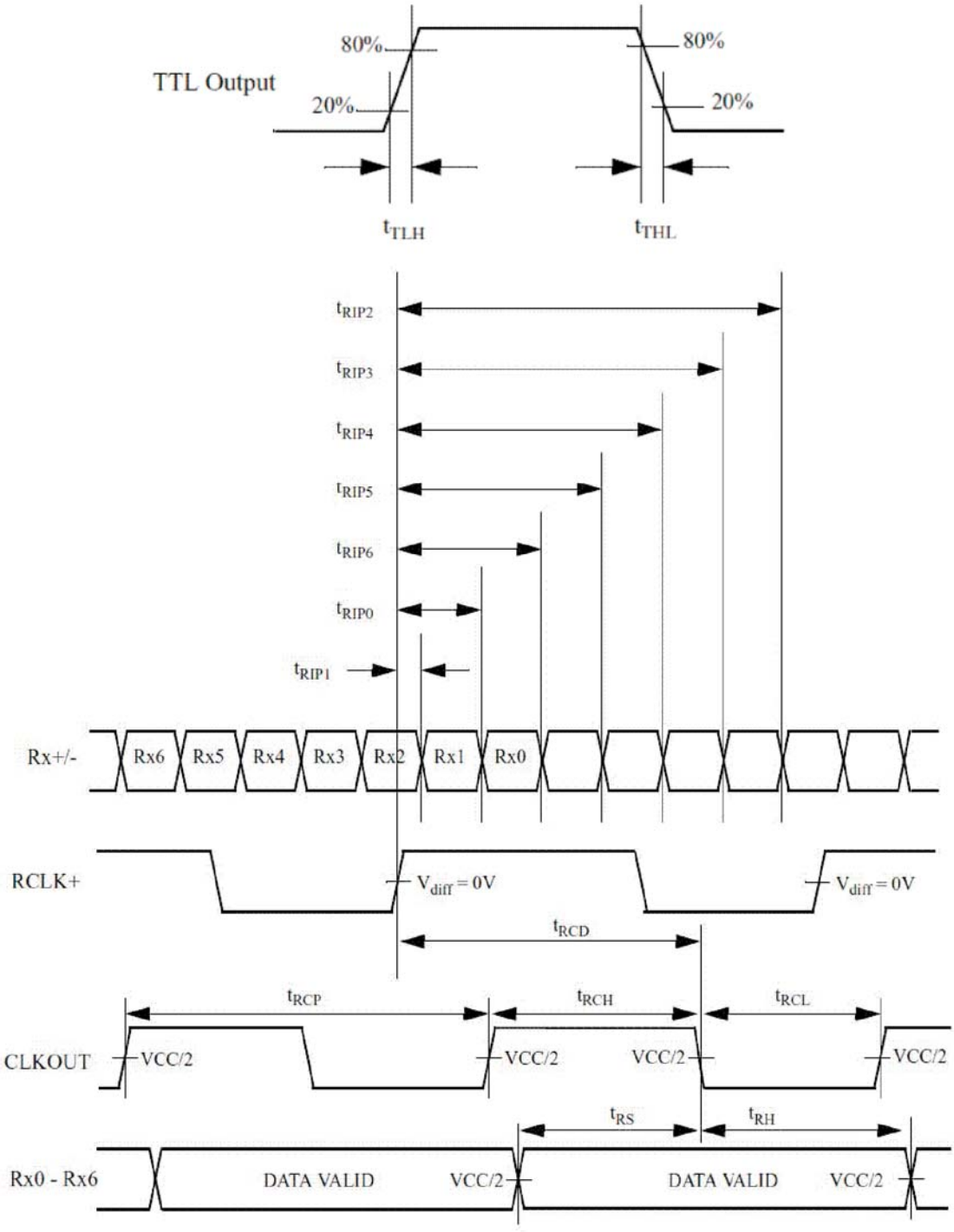
Vertical timing

3.2 LVDS Switching Characteristics

3.2.1 LVDS Timing Condition

Symbol	Parameter		Min.	Typ.	Max.	Unit.	Note
tRCP	CLK OUT Period	VCC = 3.0 - 3.6V	11.76	T	50.0	ns	
		VCC = 2.5 - 3.6V	14.28	T	50.0	ns	
tRCH	CLK OUT High Time		-	4T/7	-	ns	
tRCL	CLK OUT Low Time		-	3T/7	-	ns	
tRCD	RCLK +/- to CLK OUT Delay		-	5T/7	-	ns	
tRS	TTL Data Setup to CLK OUT		0.35T-0.3	-	-	ns	
tRH	TTL Data Hold from CKL OUT		0.45T-1.6	-	-	ns	
tTLH	TTL Low to High Transition Time		-	2.0	3.0	ns	
tTHL	TTL High to Low Transition Time		-	1.8	3.0	ns	
tRIP1	Input Data Position0 (T = 11.76ns)		-0.4	0.0	0.4	ns	
tRIP0	Input Data Position1 (T = 11.76ns)		T/7-0.4	T/7	T/7+0.4	ns	
tRIP6	Input Data Position2 (T = 11.76ns)		2T/7-0.4	2T/7	2T/7+0.4	ns	
tRIP5	Input Data Position3 (T = 11.76ns)		3T/7-0.4	3T/7	3T/7+0.4	ns	
tRIP4	Input Data Position4 (T = 11.76ns)		4T/7-0.4	4T/7	4T/7+0.4	ns	
tRIP3	Input Data Position5 (T = 11.76ns)		5T/7-0.4	5T/7	5T/7+0.4	ns	
tRIP2	Input Data Position6 (T = 11.76ns)		6T/7-0.4	6T/7	6T/7+0.4	ns	
tRPLL	Phase Lock Loop Set				10.0	ms	

3.2.2 LVDS AC Timing



4. Optical Characteristics

4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

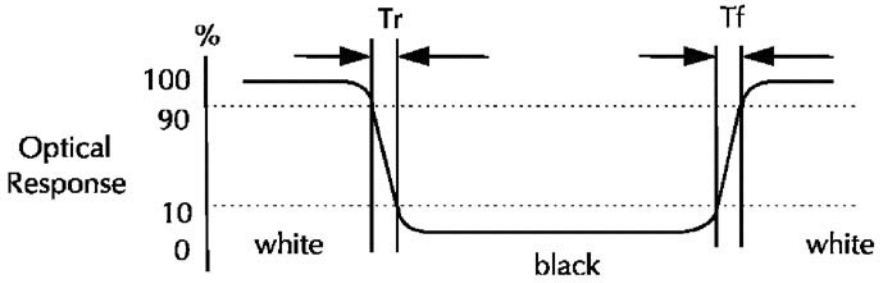
Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		B		(280)	(350)	--	cd/m^2	
Response time		T_r	θ=0°	-	5	7	ms	.
		T_f		--	20	28	ms	
Contrast ratio		CR	At optimized viewing angle	(400)	(500)	--	--	
Luminance Uniformity		ΔL		70	80		%	
Color Chromaticity (CIE 1931)	White	Wx	θ=0° Normal Viewing Angle	(0.280)	(0.310)	(0.340)	--	BM-7A
		Wy		(0.330)	(0.360)	(0.390)		
Viewing Angle (6H)	Hor.	θ_R	CR≥10	60	70	--	Degree	
		θ_L		60	70	--		
	Ver.	θ_U		40	50	--		
		θ_D		50	60	--		

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7A(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

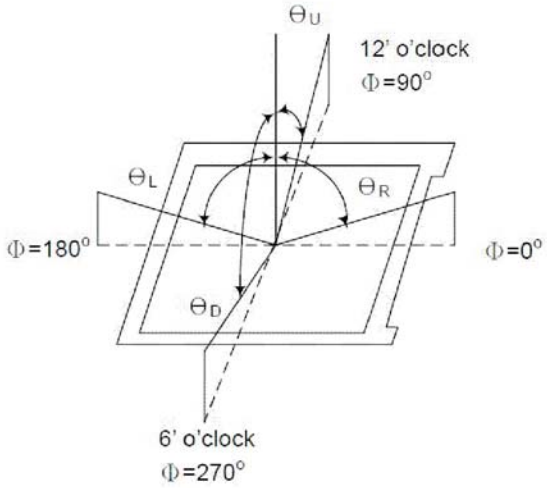


c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

5. I/O Terminal

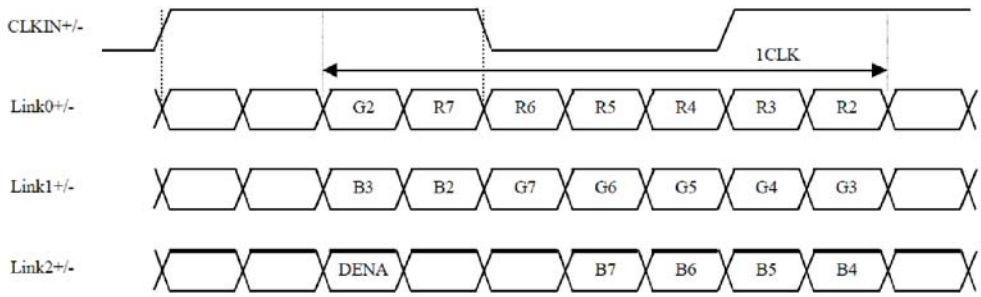
5.1 Pin Assignment

Pin No.	Symbol	I/O	Function	Remark
1	VCC	P	Power Supply Logic voltage +3.3V	
2	VCC	P	Power Supply Logic voltage +3.3V	
3	VSS	P	Ground	
4	VSS	P	Ground	
5	RIN0-	I	Negative LVDS differential data input	
6	RIN0+	I	Positive LVDS differential data input	
7	VSS	P	Ground	
8	RIN1-	I	Negative LVDS differential data input	
9	RIN1+	I	Positive LVDS differential data input	
10	VSS	P	Ground	
11	RIN2-	I	Negative LVDS differential data input	
12	RIN2+	I	Positive LVDS differential data input	
13	VSS	P	Ground	
14	RCLK-	I	Negative LVDS differential clock input	
15	RCLK+	I	Positive LVDS differential clock input	
16	VSS	P	Ground	
17	VLED	P	Power Supply LED voltage +5V	
18	VLED	P	Power Supply LED voltage +5V	
19	ADJ	I	Back-light Dimming control	
20	VSS	P	Ground	

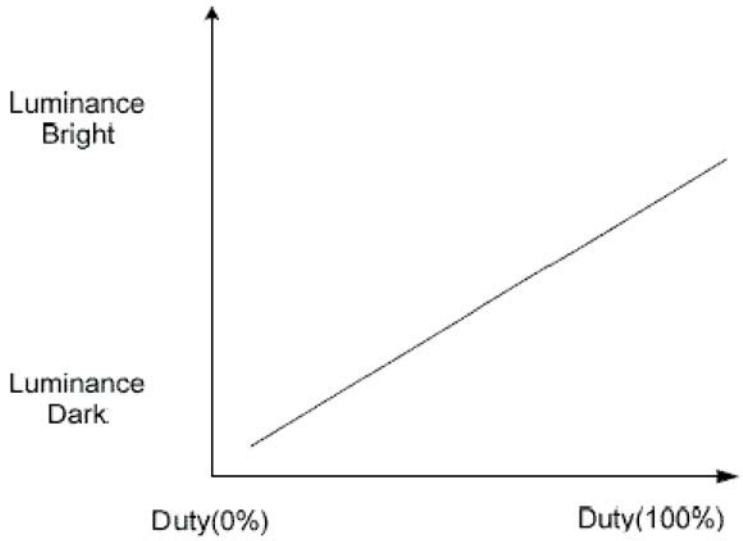
I: Input, O: Output, P: Power

Notes:

1) VSS Pin must ground contact, can not be floating.

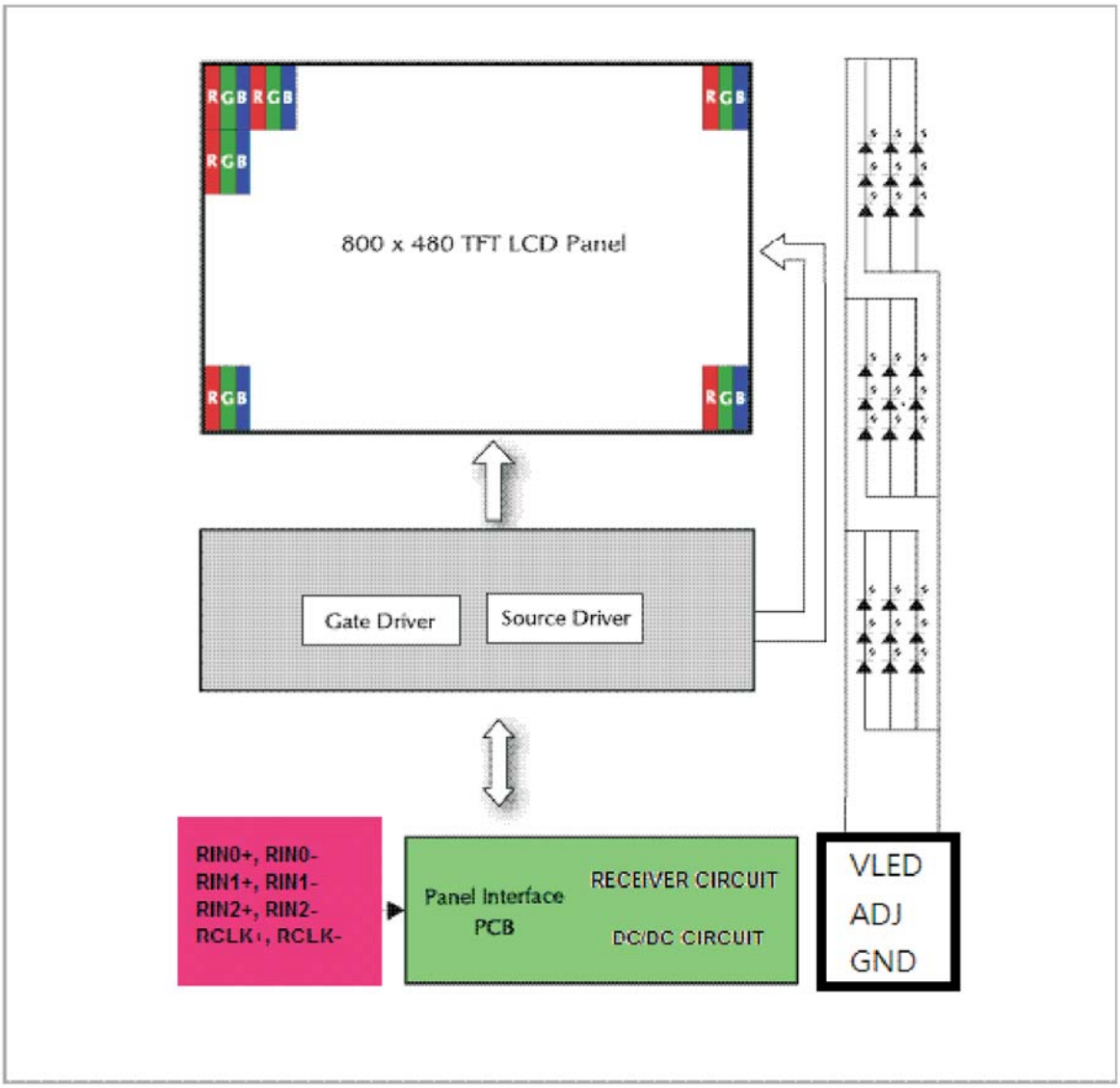


5.2 Back-light Dimming



Note 2: ADJ signal=0~3.3V, Operating frequency:1KHz

5.3 Block Diagram



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6. Displayed Color and Input Data

	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(0)	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	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	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(62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(61)	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(1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	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(62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(61)	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(1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(0)	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(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(61)	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(1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

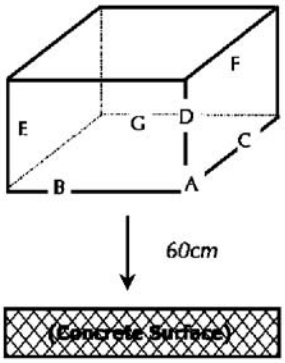
0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

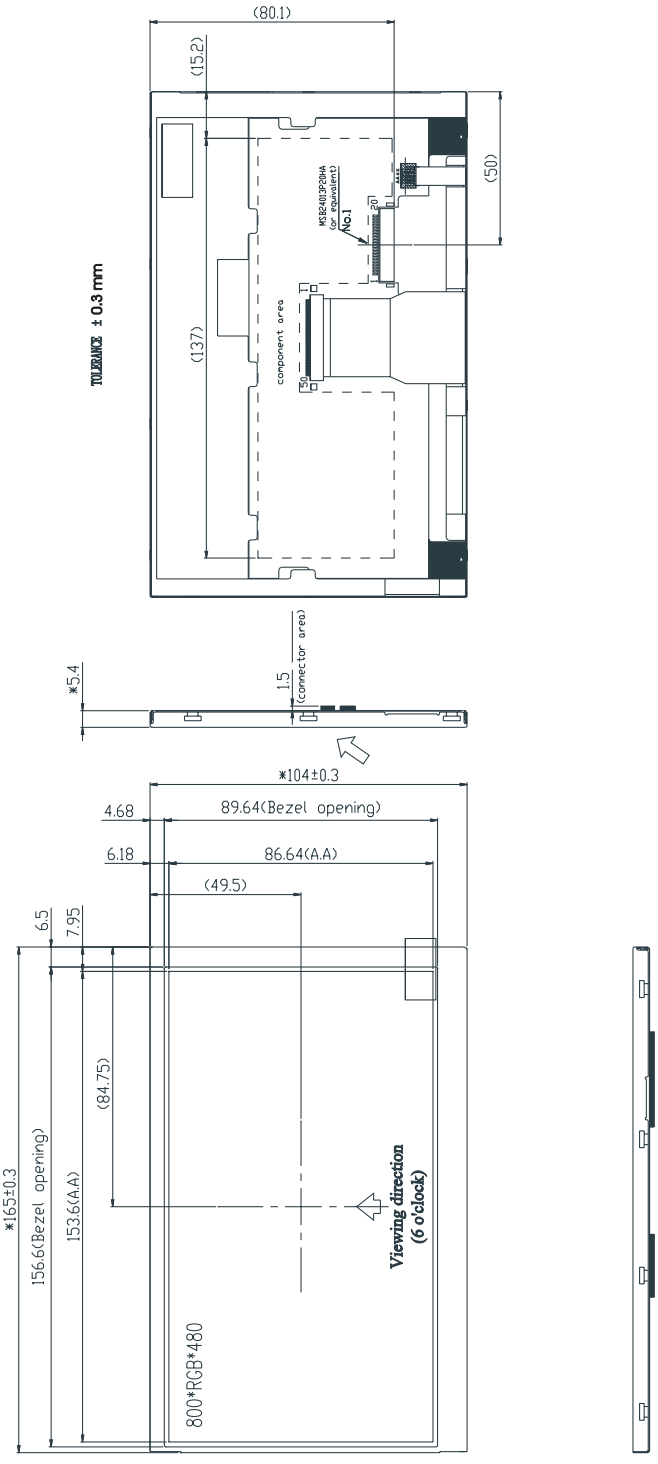
7. Reliability Condition

No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.
Temperature: 20±5°C.
Humidity: 65±5%RH.
Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state).	1
3	High Temperature Storage	80°C±2°C, 240hrs.	2
4	Low Temperature Storage	-30°C±2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	50°C±2°C, 90%, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  *Dropping method corner dropping:* *A corner: Once edge dropping.* *B, C, D edge: Once face dropping.* *E, F, G face: Once.*	

Notes:
1. No dew condensation to be observed.
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
3. Vibration test will be conducted to the product itself without putting I in a container.



No:	PIN NAME
1	VCC
2	VCC
3	VSS
4	VSS
5	RIN0-
6	RIN0+
7	VSS
8	RIN1-
9	RIN1+
10	VSS
11	RIN2-
12	RIN2+
13	VSS
14	RCLK-
15	RCLK+
16	VSS
17	VDD_3.0V
18	VDD_5.0V
19	ADJ
20	VSS

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9. Incoming Inspection Standards

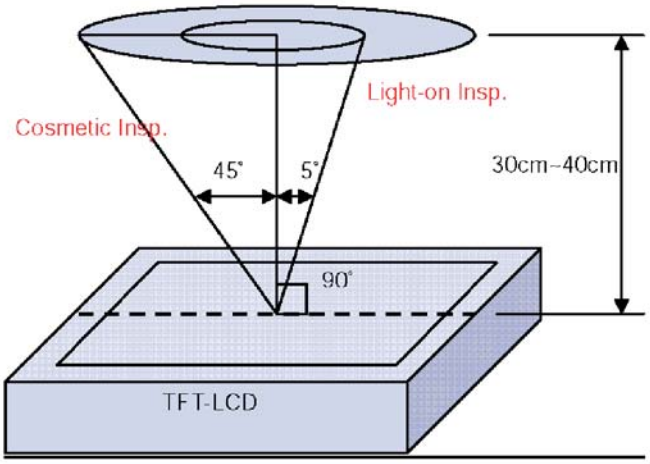
9.1 Inspection and Environment Conditions

9.1.1 Inspection Conditions:

(1)Inspection Distance: 35 cm±5cm

(2)View Angle : Light-on Inspection Angle : ±5°

Cosmetic Inspection Angle : ±45°



(perpendicular to LCD panel surface)

9.1.2 Environment Conditions:

Ambient Temperature		23℃±5℃
Ambient Humidity		55±10%RH
Ambient Illumination	Cosmetic Inspection	more than 600 Lux
	Functional Inspection	300~500 Lux

9.1.3 Sampling Conditions:

(1) Lot Size: Quantity of shipment lot per model

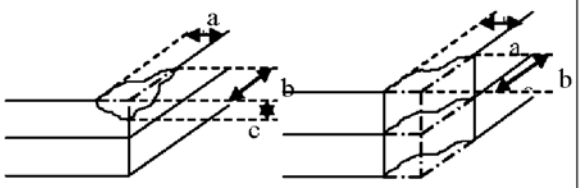
(2) Sampling Method:

Sampling Plan		MIL-STD-105E Normal Inspection, Single Sampling Level II
AQL	Major Defect	1.0%
	Minor Defect	1.5%

(3) The classification of Major(MA) and Minor(MI) defects is shown as 3. Inspection Criteria.

9.1.4 Inspection Criteria

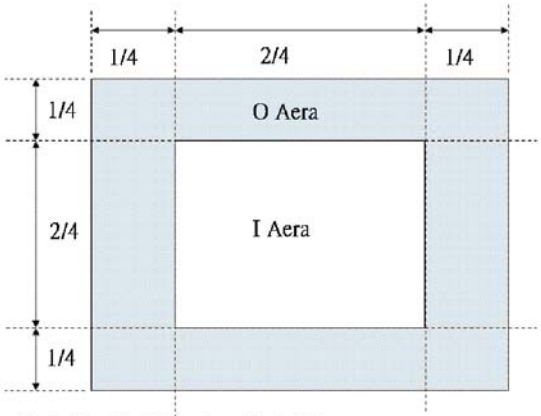
9.1.4.1 Cosmetic Inspection(Panel):

Item	Judgment Criteria	Classification
Chipping on Panel	 a≦3.0mm、b≦3.0mm、c≦t (Bottom glass thickness)	MA
Scratch on Panel *Note-2	W≦0.05mm or L< 5mm: Ignored 0.05mm<W≦0.1mm and L≦5mm: N≦5 W>0.1mm or L>5mm: Not allowed	MI
Bubble or Dent on Panel *Note-3	D≦0.2mm: Ignored 0.2mm<D≦0.3mm: N≦5 D>0.3mm: Not allowed	MI
Panel Crack	 Not Allowed crack	MA
Bezel Deformation	Obvious deformation is not allowed.	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	L≦20mm , W≦0.2 , N≦3	MI
Metal Squash Dent /Flange(Front Side)	D(W)≦1,L≦3,N≦3;	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI
Outline Dimension	Must in Spec, refer to related product spec.	MI

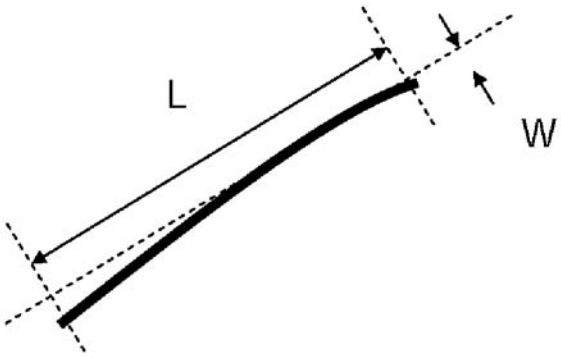
9.1.4.2 Functional Inspection:

Item	Judgment Criteria				Classification
	Area(Note1)		I	O	
Point Defect	Bright dot	Random	2		MI
		2 dots adjacent	0	0	
		3 dots adjacent or more	0	0	
	Dark dot	Random	3		
		2 dots adjacent	0		
		3 dots adjacent or more	0	0	
	Total Dot Defect		5		
	Distance	Distance between Bright and Bright dot	L≧5mm		
		Distance between Bright and Dark dot	L≧5mm		
		Distance between Dark dot	L≧5mm		
	(1) It is defined as Point Defect if defect area＞0.5dot (2) It is ignored if defect area≦0.5dot (3)Weak point defect will be defined as Bright Dot if it can be observed through ND filter 5%(Full Screen Black Inspection)				
Line Defect	Obvious vertical or horizontal line defect is not allowed.				MA
Mura	Not allowed if it can be observed through ND Filter 5 %				MI
Foreign Material in spot shape *Note-3	D≦0.2mm: Ignored 0.2mm<D≦0.5mm: N≦8 D>0.5mm: Not allowed				MI
Foreign Material in line or spiral shape *Note-4	W≦0.05mm or L≦5mm: Ignored 0.05mm<W≦0.2mm and L1.0mm≦5mm: N≦8 W>0.2mm or L>5mm: Not allowed				MI
Display Function Abnormal	No Malfunction can be allowed				MA

Note-1 : I/O Area Definition

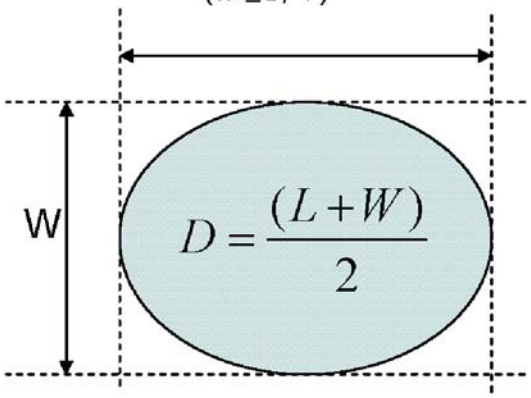


Note-2 : Polarizer Scratch



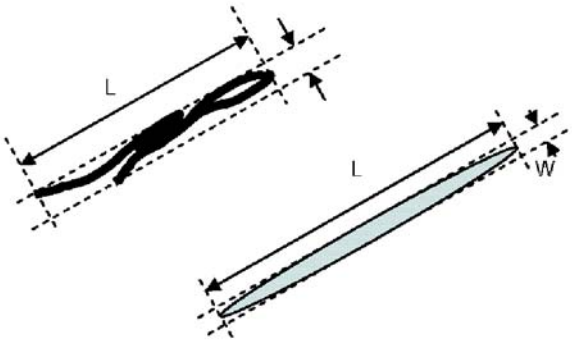
Note-3 : Spot Foreign Material

(W ≧L / 4)



Note-4 : Line or Spiral Foreign Material

(W<L / 4)



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