



深圳显昶光电科技有限公司

Shenzhen Xianyang Optoelectronic Technology Co., Ltd

PRODUCTION SPECIFICATION OF LCD MODULE

MODULE NO.: XY104XGH01

Customer Name:			
Customer Part Number:			
Approved By:		Date:	

Prepared By	Checked By	Approved By

Record of Revisions			
Rev.	Date	Sub-Model	Description of change
1.0	Jun. 8, 2020		Tentative Product Specification was first released.

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1.0 GENERAL DESCRIPTION

1.1 Introduction

TDO Display model XY104XGH01 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 and a back light system. This TFT LCD has a 10.4 inch diagonally measured active display area with HD (1024 horizontal by 768 vertical pixel) resolution.

1.2 Features

- 10.4 (4:3 diagonal) inch configuration
- 16.2M
- ROHS / Halogen Free Compliance

1.3 Applications

- Automobile

1.4 General information

Item		Specification	Unit
Outline Dimension		236 (H) x 174.3 (V) x 7.4 (D) (Typ)	mm
Display area		211.2(H) x 158.4(V) (10.4" diagonal)	mm
Number of Pixel		1024(H) x 768(V)	pixels
Pixel pitch		0.20625(H) x 0.20625(V)	mm
Pixel arrangement		RGB Vertical Stripe	
Display mode		Normally Black	
NTSC		70(Typ.)	%
Surface treatment		Antiglare, Hard-Coating (3H)	
Weight		314	g
Back-light		Single LED (Side-Light type)	
Power Consumption	Logic System (White Pattern)	Logic 2.0W(max) @V _{DVDD} =3.3V	W
	B/L System	6.144(Max.)	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	235.5	236	236.5	mm
	Vertical (V)	174.0	174.3	174.6	mm
	Depth (D)	5.3	5.6	7.4	mm
Weight		-	314	-	g

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V_{DVDD}	-0.3	5	V	
	V_{DVDD_LVDS}				
	V_{AVDD}	-0.5	15	V	
	V_{GH}	-0.3	42	V	
	V_{GL}	-20	0.3	V	
	$V_{GH} - V_{GL}$	-0.3	40	V	
Logic Signal Input Level	V_{DVDD} V_{DVDD_LVDS}	-0.3	5	V	

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-20	70	°C	
Storage Temperature	T_{stg}	-30	80	°C	

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0$ Normal viewing angle	600	900	-		(1)(2)
Response time	Rising	TR+TF		-	30	40	msec	(1)(3)
	Falling							
White luminance (Center)		Y _L		500	600	-	cd/m ²	(1)(4) (I _L =480mA)
Color chromaticity (CIE1931)	White	W _x		0.273	0.313	0.353		(1)(4)
		W _y		0.289	0.329	0.369		
	Red	R _x		0.614	0.654	0.694		
		R _y		0.301	0.341	0.381		
	Green	G _x		0.264	0.304	0.344		
		G _y		0.585	0.625	0.665		
	Blue	B _x		0.104	0.144	0.184		
		B _y		0.05	0.090	0.13		
Viewing angle	Hor.	Θ_L	CR>10	80	85	-		
		Θ_R		80	85	-		
	Ver.	Θ_U		80	85	-		
		Θ_D		80	85	-		
Brightness uniformity		B _{UNI}	$\Theta=0$	70	80	-	%	(5)
Optima View Direction		Free						(6)

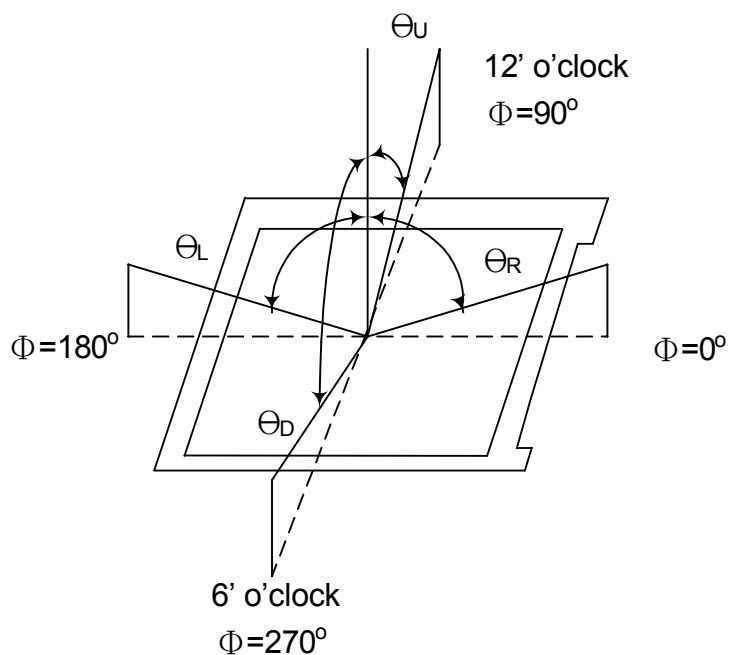
3.2 Measuring Condition

- Measuring surrounding : dark room
- LED current I_L : 480mA
- Ambient temperature : 25±2°C
- 15min. warm-up time.

3.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size : 20 ~ 21 mm

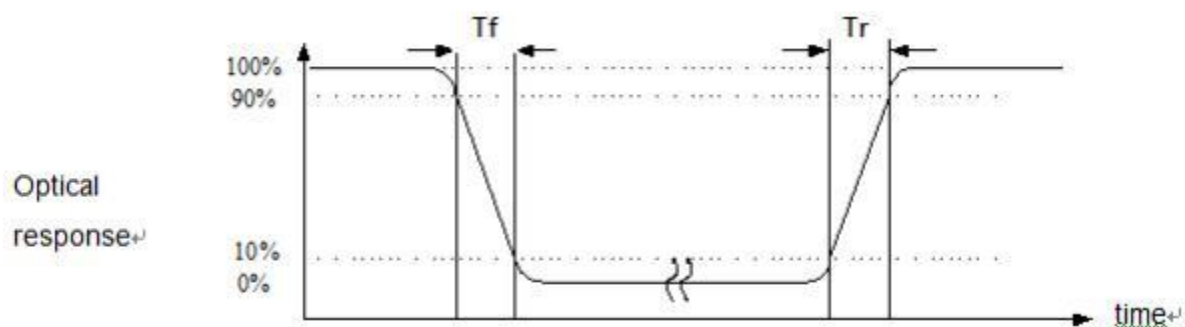
Note (1) Definition of Viewing Angle:



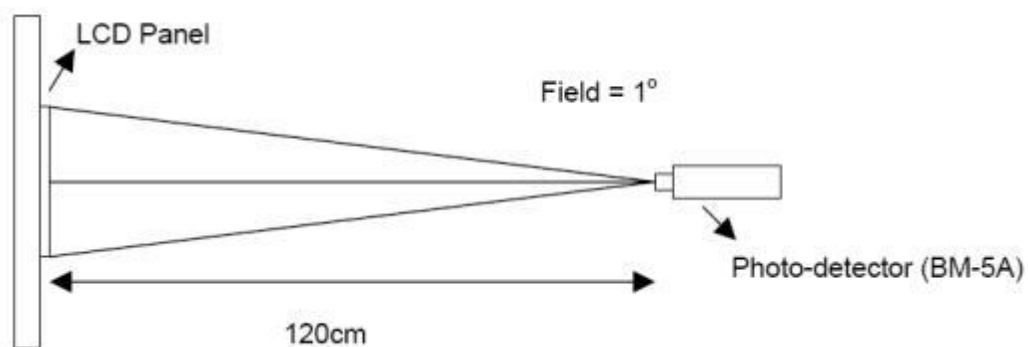
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

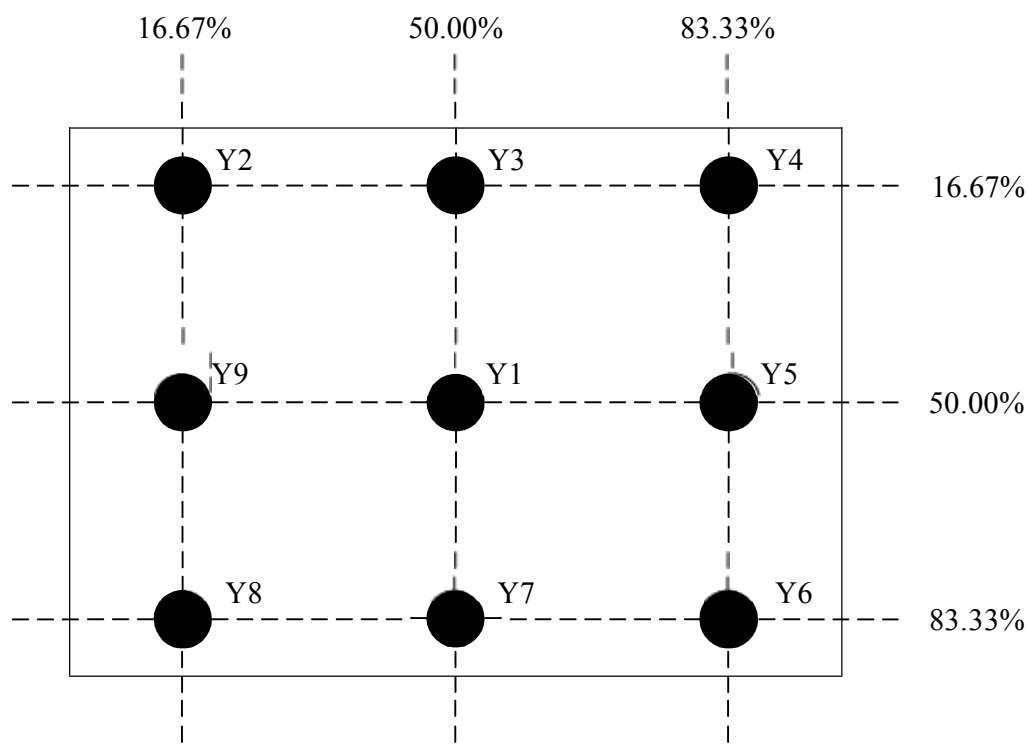
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Definition of brightness uniformity

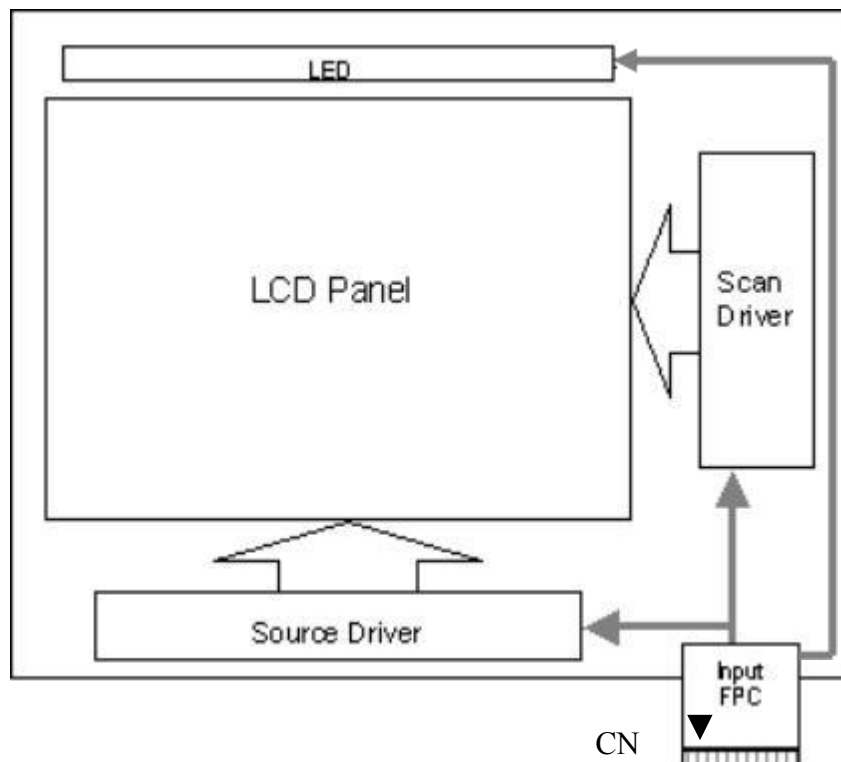


$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

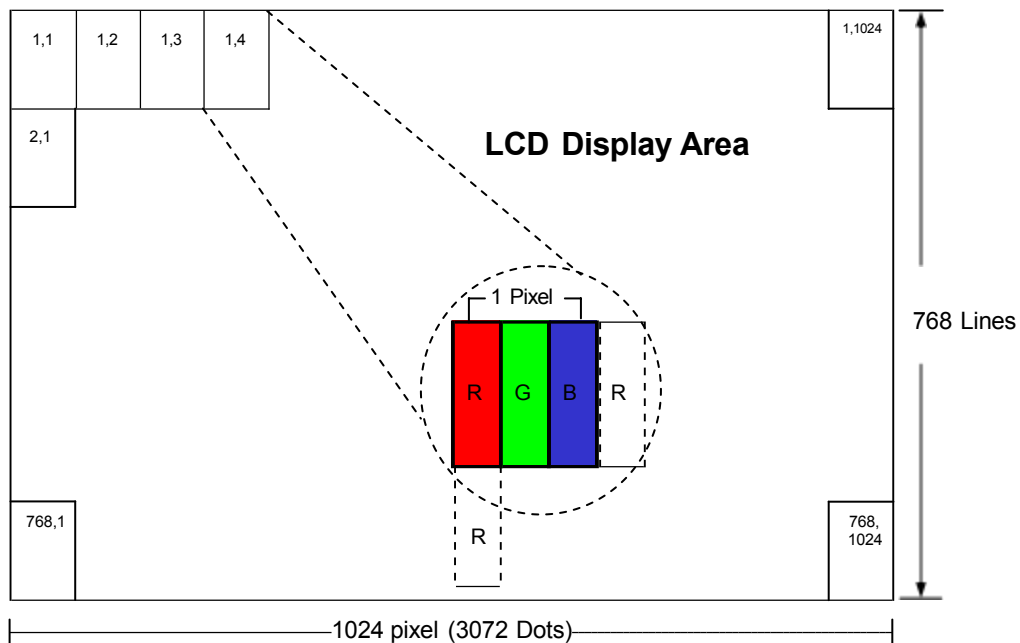
Note (6) : Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module:



4.2 Pixel Format



4.3 Relationship Between Displayed Color and Input

	Display	MSB LSB								MSB LSB								MSB LSB								Gray scale Level
		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	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:								:								:								L3...L251
		H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
	Light	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L2
		:								:								:								L3...L251
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252
	Light	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L254
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L2
		:								:								:								L3...L251
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L252
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L2
		:								:								:								L3...L251
		H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	L252
	Light	H	H	H	H	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	L253
		H	H	H	H	H	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	L	L254
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255

5.0 INTERFACE PIN CONNECTION

5.1 FPC Pin Assignment:

FPC connector is used for electronics interface. The recommended model is CN1 (Input signal): 089K60-000100-G2-R (STARCONN)

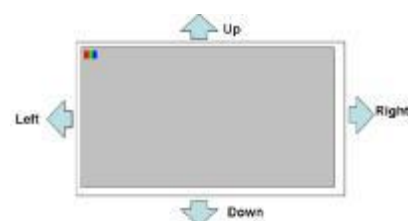
Pin NO.	Symbol	Description	Note
1	AGND	Analog ground	
2	AVDD	Analog power	
3	DVDD	Digital power	
4	GND	Digital ground	
5	VCOM	Not connect	
6	DVDD	Digital power	
7	GND	Digital ground	
8	V14	Not connect	
9	V13	Not connect	
10	V12	Not connect	
11	V11	Not connect	
12	V10	Not connect	
13	V9	Not connect	
14	V8	Not connect	
15	GND	Digital ground	
16	DVDD_LVDS	LVDS power	
17	GND	Digital ground	
18	PIND3	Positive LVDS differential data input	
19	NIND3	Negative LVDS differential data input	
20	GND	Digital ground	
21	PINC	Positive LVDS differential clock input	
22	NINC	Negative LVDS differential clock input	
23	GND	Digital ground	
24	PIND2	Positive LVDS differential data input	
25	NIND2	Negative LVDS differential data input	
26	GND	Digital ground	
27	PIND1	Positive LVDS differential data input	
28	NIND1	Negative LVDS differential data input	
29	GND	Digital ground	
30	PIND0	Positive LVDS differential data input	

Pin NO.	Symbol	Description	Note
31	NIND0	Negative LVDS differential data input	
32	GND	Digital ground	
33	GND_LVDS	LVDS ground	
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ,C=0.1uF)	
35	STBYB	Standby mode,normally pull high STBYB= 1, normal operation STBYB=0 ,timing control, source driver will turn off, all output are high-Z	
36	SHLR	Left or right display control	Note 1
37	DVDD	Digital power	
38	UPDN	Up / down display control	Note 1
39	AGND	Analog ground	
40	AVDD	Analog power	
41	VCOM	Not connect	
42	DITH	Dithering function enable control.Normally pull low DITHER= "1",Enable internal dithering function DITHER= "0",Disable internal dithering function	
43	GND	Digital ground	
44	DVDD	Digital Power	
45	GND	Digital ground	
46	V7	Not connect	
47	V6	Not connect	
48	V5	Not connect	
49	V4	Not connect	
50	V3	Not connect	
51	V2	Not connect	
52	V1	Not connect	
53	GND	Digital ground	
54	DVDD	Digital power	

Pin NO.	Symbol	Description	Note
55	SELB	6bit/8bit mode select, SELB = "0", LVDS input data is 8bits SELB = "1": LVDS input data is 6bits	Note 2
56	VGH	Positive power for TFT	
57	DVDD	Digital power for Gate IC	
58	VGL	Negative power for TFT	
59	GND	Digital ground for Gate IC	
60	NC	Not connect	

Note 1 : UPDN and SHLR control function

UPDN	SHLR	Data shifting
0	1	Normally display
0	0	Inverse Left and Right
1	1	Inverse Up and Down
1	0	Inverse Left and Right Inverse Up and Down



Note 2 : If LVDS input data is 6 bits, SELB must be set to High

If LVDS input data is 8 bits, SELB must be set to Low

DITH and SELB control function

DITH	SELB	Data shifting
0	1	Colors (262K)
0	0	Colors (262K)
1	1	Colors (262K)
1	0	Colors (16.2M)

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DVDD}	3	3.3	3.6	V	
	V_{DVDD_LVDS}					
	VGH	24	25	26	V	Note (1)
	VGL	-9	-10	-11	V	Note (2)
	AVDD	11.8	12.1	12.4	V	
Input signal voltage	ViH	0.8 VDD		VDD	V	
	ViL	0		0.2VDD	V	
Current of power supply	IDD		28	36.4	mA	VDD =3.3V/ Note (3)
	Iavdd		75	95	mA	AVDD=12.1V/ Note (3)
	Ivgh		0.85	1.25	mA	VGH=25V/ Note (3)
	Ivgl		1.95	2.54	mA	VGL=-10V/ Note (3)

Note :

(1) : VGH is TFT Gate operating Voltage.

(2) : VGL is TFT Gate operating Voltage.

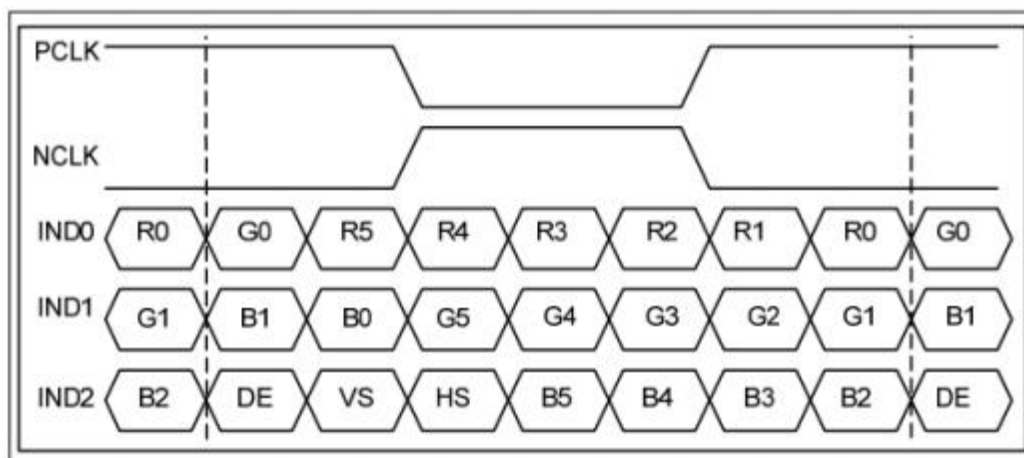
(3) : @ White Pattern & 60Hz °

6.2 Switching Characteristics for LVDS Receiver

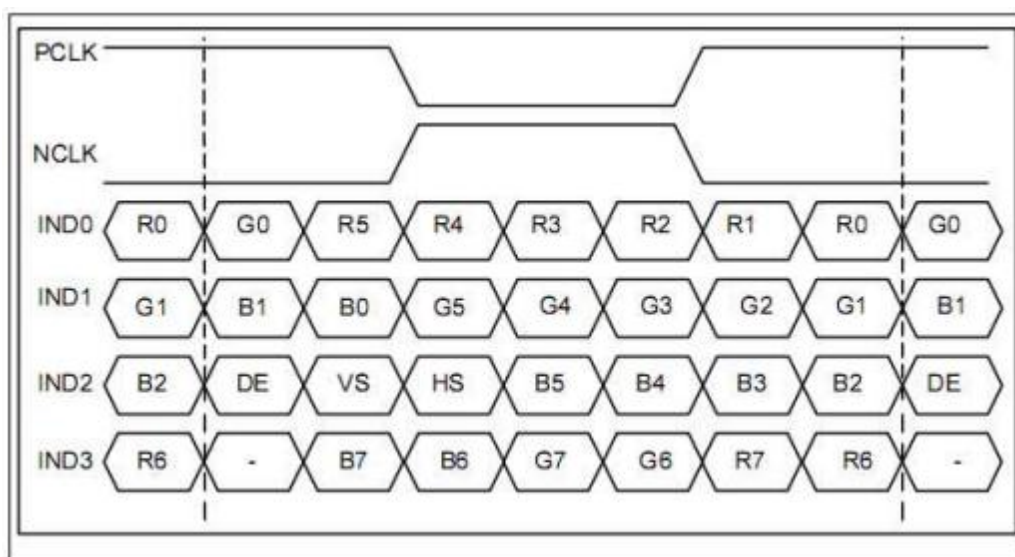
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth			100	mV	$V_{CM}=1.2V$
Differential Input Low Threshold	Vtl	-100			mV	
Input Current	I_{IN}	-10		10	uA	
Differential input Voltage	$ V_{ID} $	0.1		0.6	V	
Common Mode Voltage Offset	V_{CM}	0.7	1.2	1.6	V	

6.3 Bit LVDS input

6.3.1 6bit LVDS input



6.3.2 8Bit LVDS input

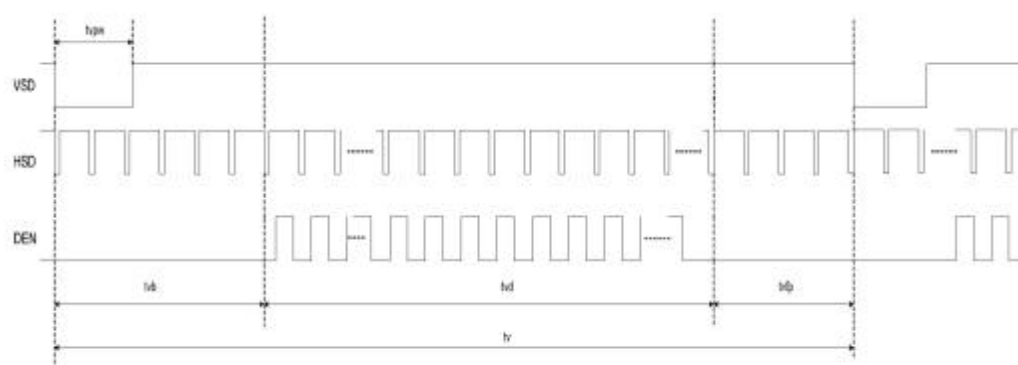


6.4 Interface Timing (DE mode)

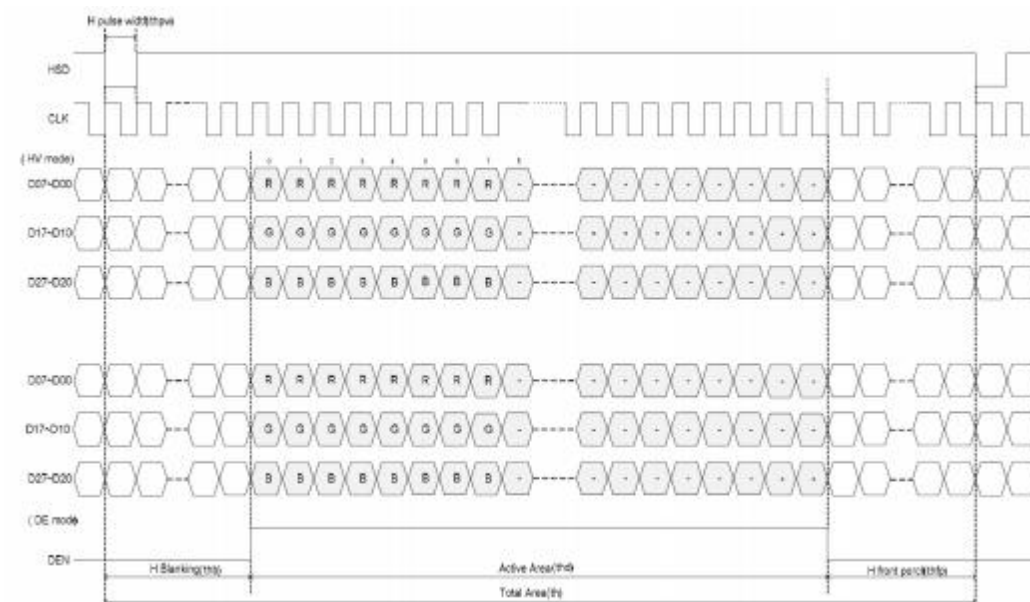
DE mode					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	52	65	71	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	768			H
VSYNC period time	tv	778	806	845	H
VSYNC blanking	tvb+tvfp	10	38	77	H

Timing Diagram of Interface Signal (DE mode)

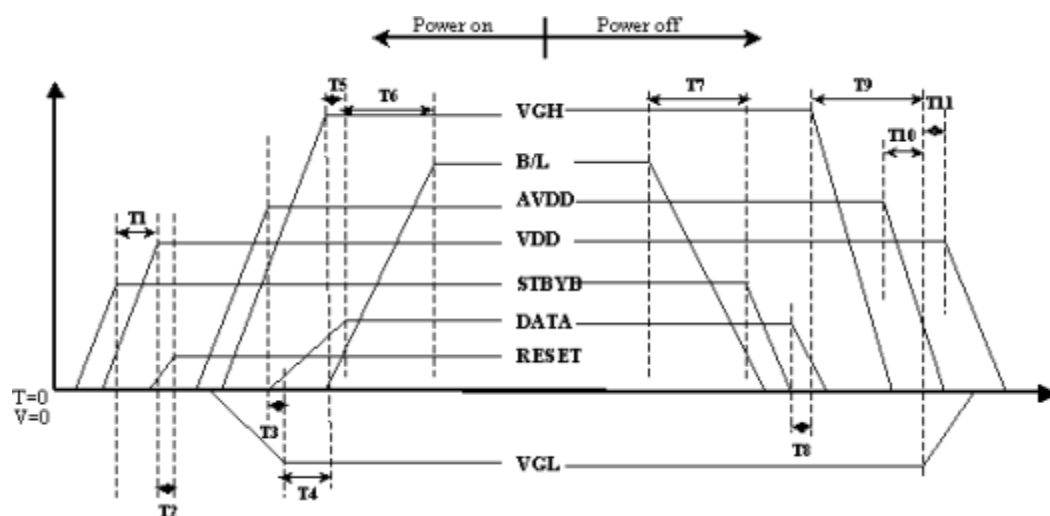
(1). Vertical input timing



(2). Horizontal input timing



6.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit
T1	0	--	--	ms
T2	50	--	--	ms
T3	5	--	--	ms
T4	10	--	--	ms
T5	20	--	--	ms
T6	50	--	--	ms
T7	20	--	--	ms
T8	10	--	--	ms
T9	20	--	--	ms
T10	10	--	--	ms
T11	20	--	--	ms

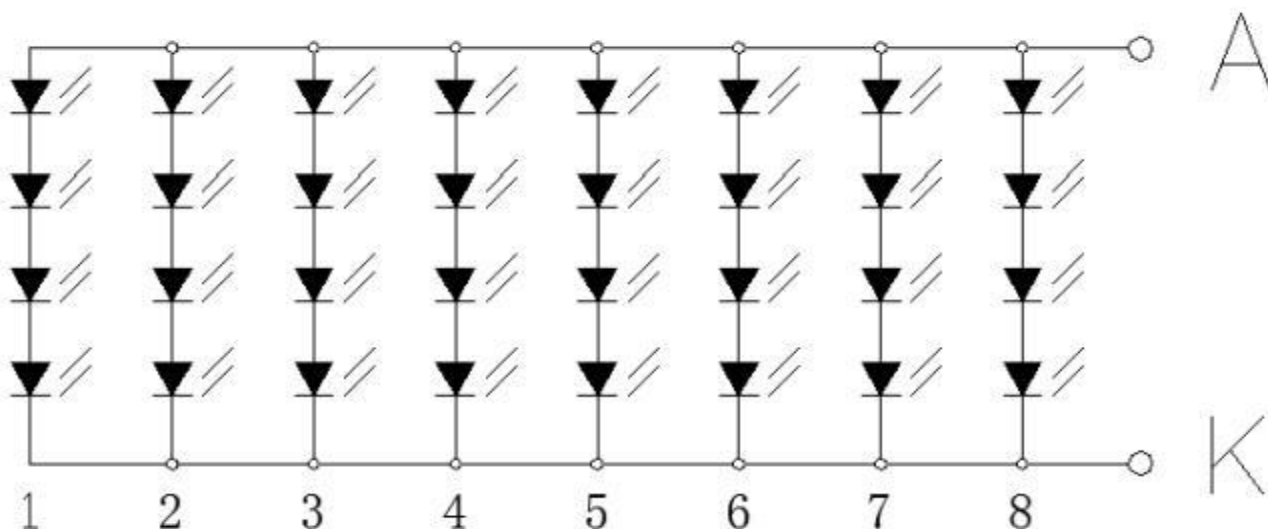
6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_L	--	320	--	mA	$T_a=25^{\circ}\text{C}$
LED Voltage	V_L	12V	13.2	14	Volt	$T_a=25^{\circ}\text{C}$
LED Life-Time	N/A	30,000	--	--	Hour	$T_a=25^{\circ}\text{C}$ $I_F=60\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3^{\circ}\text{C}$, typical I_L value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=320\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 320mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit



6.7 Electrostatic Discharge:

ITEM	CONDITON	NOTE
ESD	Air 150pF , 330 Ω , +/-15kV & Contact 150 pF , 330 Ω +/-8kV	Note1
	200pF , 0 Ω , +/-200V contact test	Note2

Note: Measure

Note1: LCD glass and metal bezel

Note2: IF connector pins

7.0 Reliability test items

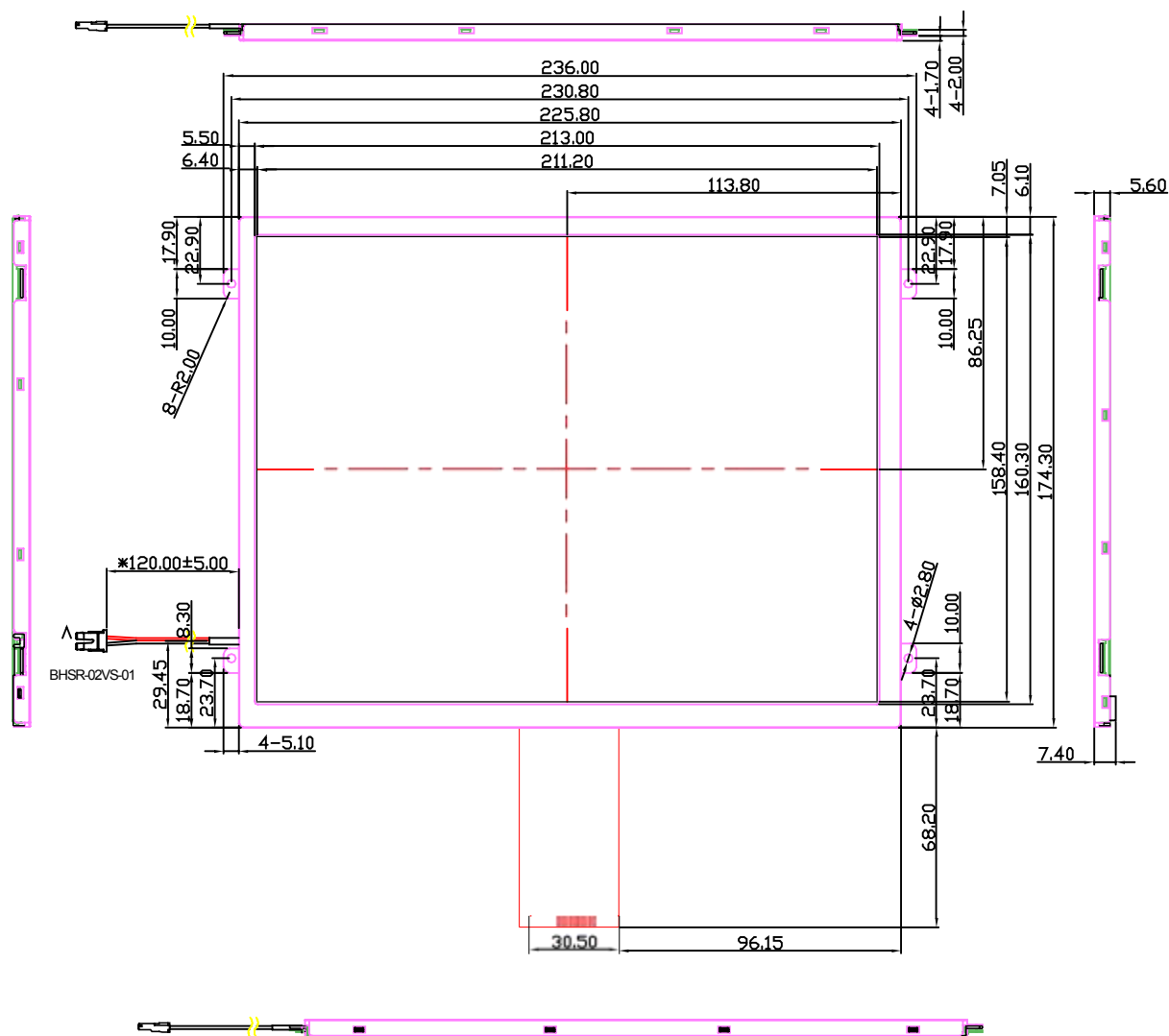
No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80°C, 240hrs	
2	Low Temperature Storage	Ta=-30°C, 240hrs	
3	High Temperature Operation	Ta=+70°C, 240hrs	
4	Low Temperature Operation	Ta=-20°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) → +80°C(30min), 200 cycles	
7	Electrostatic Discharge	±200V, 200pF(0Ω) 1 time/connector	
8	Vibration	1.Random: 1.04G, 5~500Hz, XYZ, 30min/each direction 2.Sine: Freq.1.5G, 8~33.3Hz, Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hrs, Y: 4hrs	
9	Shock	Half-Sine, 100G, 6ms, ±XYZ, 3time	
10	Vibration (with carton)	Random: 0.015G ² /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ 各方向 2hrs	
11	Drop (with carton)	Drop height condition, basis on the product weight and follow QB100-0027 1 corner, 3 edges, 6 surfaces	

Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

8.0 OUTLINE DIMENSION

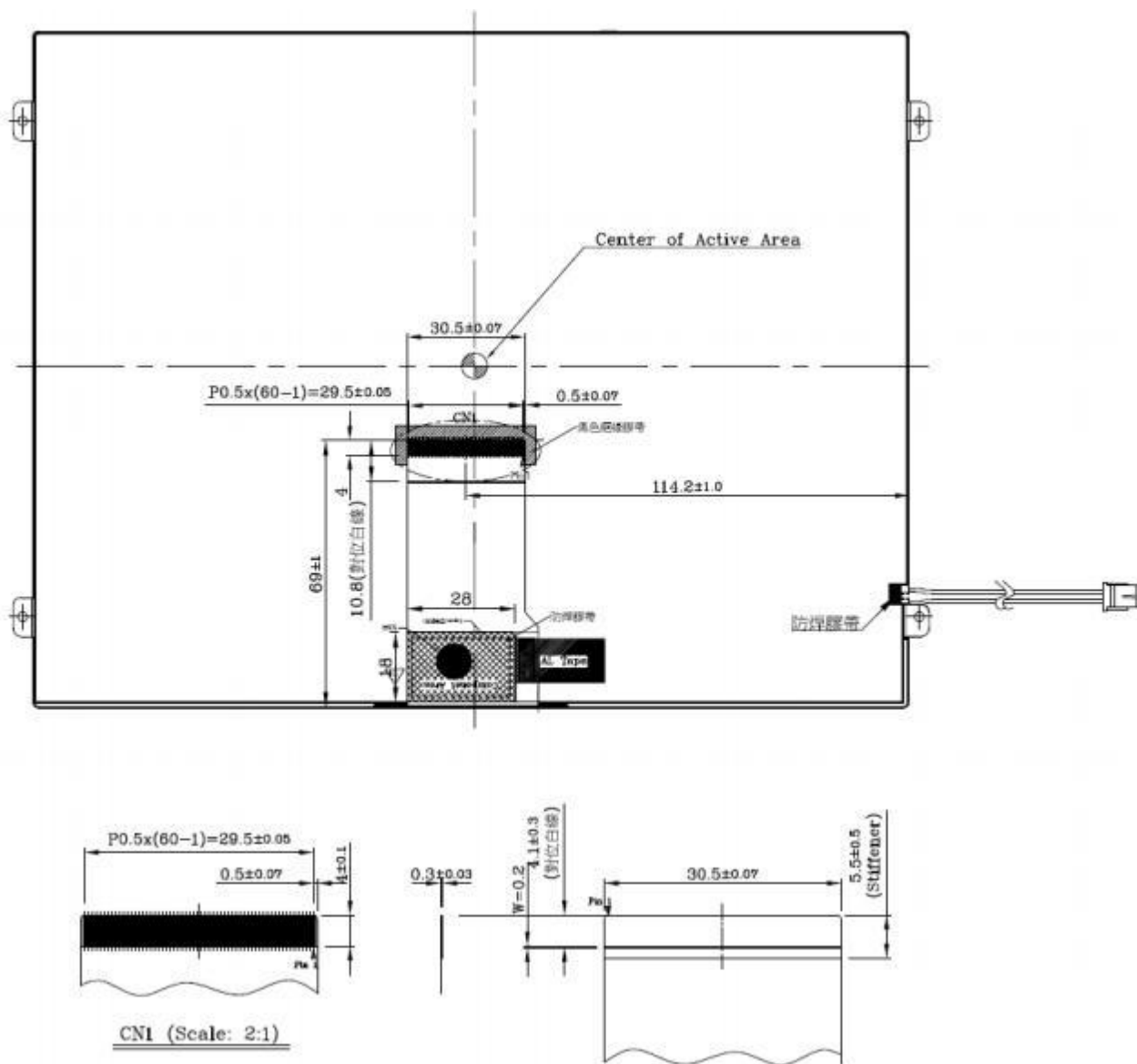
Unit : mm

8.1 Front View:



General tolerance: $\pm 0.3\text{mm}$

8.2 Rear View:



General tolerance: $\pm 0.3\text{mm}$