



HIGHNESSTM

HM101TH101B V. R
10.1" Color TFT-LCD

FUNCTIONAL DRAFT SPECIFICATION

(This document is meant for customers' approval)

Release Date
14th Jan 2021

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION WHICH IS SOLELY OWNED BY 'HIGHNESS MICROELECTRONICS PVT. LTD.' ANY UNAUTHORISED COPY OR PRINTING OR PUBLISHING OF INFORMATION IN THIS DOCUMENT IN PART OR IN COMPLETE IS RESTRICTED.

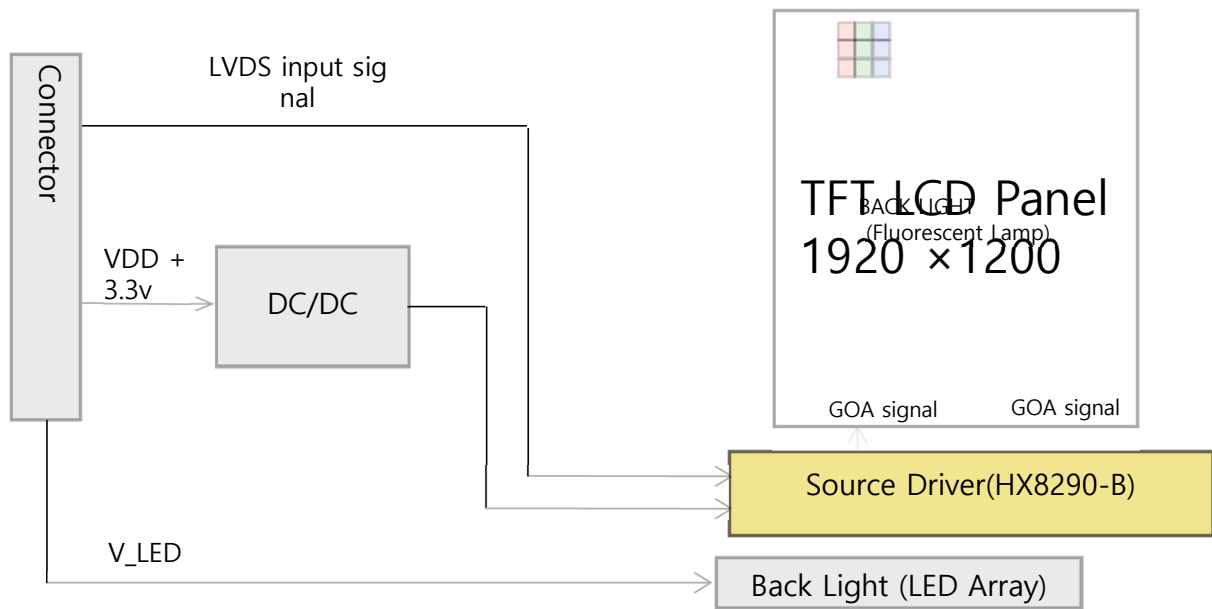
HIGHNESS MICROELECTRONICS PVT. LTD

URL: www.highnessmicro.com, Email: sales@highnessmicro.com

1.0 GENERAL DESCRIPTION

1.1 Introduction

HM101TH101B V.R is a color active matrix TFT LCD FOB using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 10.1 inch diagonally measured active area with WUXGA resolutions (1920 horizontal by 1200 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors.



1.2 Features

- LVDS Interface;
- 8bit display 16.7M colors
- High contrast ratio and Transmittance

1.3 Application

- G Industrial

1.4 General Specification

The followings are general specifications at the HM101TH101B V.R.

<Table 1. LCD Module Specifications>

Parameter	Specification	Unit
Active Area	216.8064(H)*135.504(V)	mm
Number of Pixels	1920(H)×1200(V)	pixels
Pixel Pitch	0.03764(H)×RGB×0.11292(V)	mm
Pixel Arrangement	Pixels RGB stripe arrangement	
Display Mode	Normally Black	
Display Colors	16.7M(8bit)	colors
Surface Treatment	HC	
Contrast Ratio	1500:1(typ.)	
Viewing Angle (CR> 10)	80/80/80/80(typ.)	
Response Time	30(typ.)/35(max.)	ms
Color Gamut	72%NTSC	
Luminance of White	350 (type)	cd/m ²
Outline Dimension	228.5(H)*149.3.(V)*2.6(mm)	

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

< Table 2. Absolute Maximum Ratings >

Parameter		Symbol	Min.	Max.	Unit	Remarks
Power Supply	LCD Module	VDD	VSS-0.3	3.6	V	Ta = 25 °C
Operating Temperature		T _{OP}	-20	+70	°C	
Storage Temperature		T _{ST}	-30	+85	°C	
Operating Ambient Humidity		Hop	10	90	%RH	
Storage Humidity		Hst	10	90	%RH	

3.0 ELECTRICAL SPECIFICATIONS

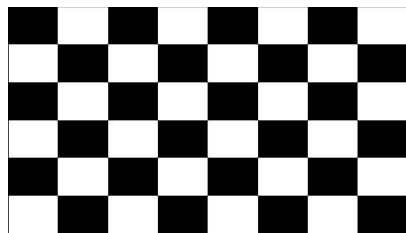
3.1 TFT LCD Module

< Table 3. LCD Module Electrical specifications > [Ta = 25±2 °C]

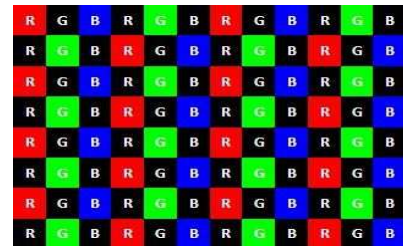
Parameter		Symbol	Values			Unit
			Min.	Typ.	Max.	
Power Supply Voltage		VDD	3.0	3.3	3.6	V
		VRP			300	mV
Power Supply Current		IDD	-	300	360	mA
Power Consumption		PLCD	-	1	1.2	W
Rush current		IRUSH	-	-	3.0	A
CMOS Interface	Input Voltage	VIH	2.7		3.3	V
		VIL	0		0.5	V
	Output Voltage	VOH	2.7		3.3	V
		VOL	0		0.5	V

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
 The current draw and power consumption specified is for VDD=3.3V, Frame rate $f_V=60\text{Hz}$ and Clock frequency = 80MHz. Test Pattern of power supply current

a) Typ : Mosaic 8 x 6 Pattern(L0/L255)



b) Max : skip subPixel(L255)



2. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

3.2 INPUT TERMINAL PIN ASSIGNMENT

This LCD employs one interface connections, a 45 pin connector is used for the LCD module electronics interface.

3.2.1 Pin assignment for LCD module

Connector: FH34SRJ-45S-0.5SH (50) (HRS) or equivalent

< Table4. Pin Assignment for LCD Module Connector >

Pin No.	Symbol	Description	I/O
1	VLED-	LED Cathode	P
2	VLED-	LED Cathode	P
3	VLED+	LED Anode	P
4	VLED+	LED Anode	P
5	NC	NC	-
6	GND	GROUND	P
7	ELV3P	EVEN LVDS Positive data signal (+)	I
8	ELV3N	EVEN LVDS Negative data signal (-)	I
9	GND	GROUND	P
10	ELV2P	EVEN LVDS Positive data signal (+)	I
11	ELV2N	EVEN LVDS Negative data signal (-)	I
12	GND	GROUND	P
13	ELVCLKP	EVEN LVDS Positive CLK signal (+)	I
14	ELVCLKN	EVEN LVDS Negative CLK signal (-)	I
15	GND	GROUND	P
16	ELV1P	EVEN LVDS Positive data signal (+)	I
17	ELV1N	EVEN LVDS Negative data signal (-)	I
18	GND	GROUND	P
19	ELV0P	EVEN LVDS Positive data signal (+)	I
20	ELV0N	EVEN LVDS Negative data signal (-)	I

Pin No.	Symbol	Description	I/O
21	GND	GROUND	P
22	OLV3P	Odd LVDS Positive data signal (+)	I
23	OLV3N	Odd LVDS Negative data signal (-)	I
24	GND	GROUND	P
25	OLV2P	Odd LVDS Positive data signal (+)	I
26	OLV2N	Odd LVDS Negative data signal (-)	I
27	GND	GROUND	P
28	OLVCLKP	Odd LVDS Positive CLK signal (+)	I
29	OLVCLKN	Odd LVDS Negative CLK signal (-)	I
30	GND	GROUND	P
31	OLV1P	Odd LVDS Positive data signal (+)	I
32	OLV1N	Odd LVDS Negative data signal (-)	I
33	GND	GROUND	P
34	OLV0P	Odd LVDS Positive data signal (+)	I
35	OLV0N	Odd LVDS Negative data signal (-)	I
36	GND	GROUND	P
37	I2C_SDA	Reserved for LCD manufacturer's use, not connection	I
38	I2C_SCL		I
39	VDD_OTP		P
40	EEPEN	Not Connection	I
41	VDDIN	Power supply VDDIN=3.3V (Typ.)	P
42	VDDIN		P
43	VDDIN		P
44	VDDIN		P
45	VDDIN		P

3.3 Interface timing Parameter and AC/DC Parameter

The HM101TH101B V.R is operated by the DE only

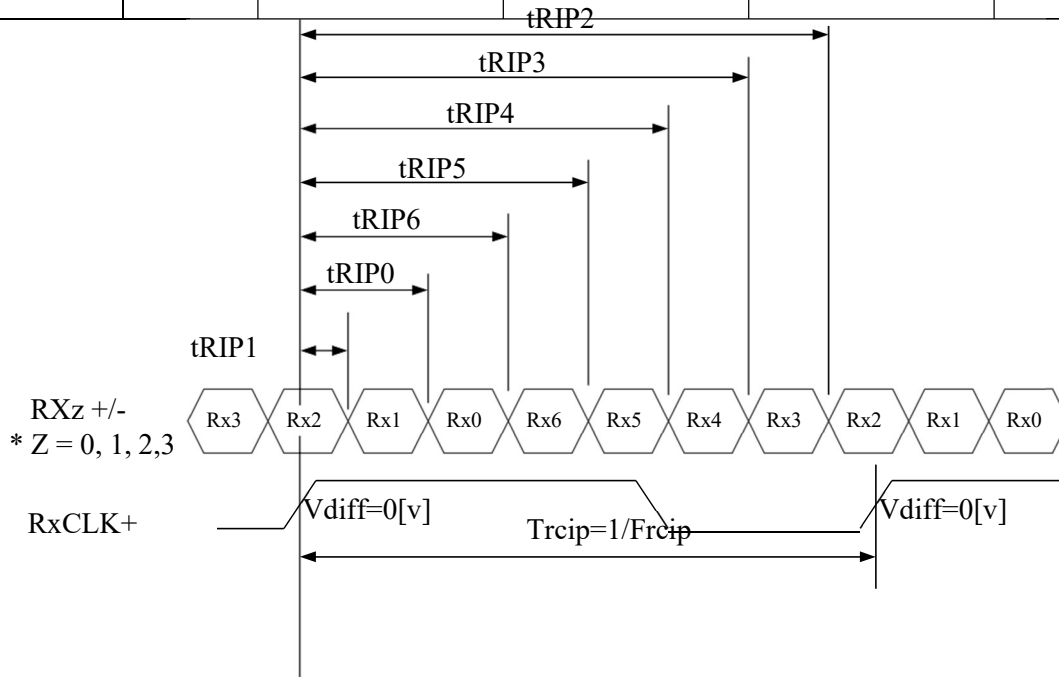
< Table5. LVDS Timing Parameter >

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK Frequency	Fdclk	74.5	77.56	85	MHz
Horizontal display area	Thd	960			DCLK
HSYNC period time	Th	989	1040	1248	DCLK
Horizontal Blank	THB	29	80	288	DCLK
HSYNC pulse width	Thp	2	10	255	DCLK
HSYNC back porch	thbp	3	6	255	DCLK
HSYNC Front porch	thfp	24	64	260	DCLK
Vertical display area	Tvd	1200			H
VSYNC period time	Tv	1243	1243	1560	H
Vertical Blank	TVB	43	43	360	H
VSYNC Pluse width	Tvp	4	4	20	H
VSYNC back porch	Tvbp	20	20	255	H
VSYNC front porch	Tvfp	19	19	260	H
Frequency	fV	-	60	-	Hz



<Table 6. LVDS AC Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKfrequency	Frcip	20	-	85	MHZ	
CLKIN Period	tRCIP	11.76	-	-	nsec	
Input Data 0	tRIP1	$tRCIP/7 \times (-0.2)$	0.0	$tRCIP/7 \times 0.2$	nsec	
Input Data 1	tRIP0	$tRCIP/7 \times 0.8$	$tRCIP/7$	$tRCIP/7 \times 1.2$	nsec	
Input Data 2	tRIP6	$tRCIP/7 \times 1.8$	$tRCIP/7 \times 2$	$tRCIP/7 \times 2.2$	nsec	
Input Data 3	tRIP5	$tRCIP/7 \times 2.8$	$tRCIP/7 \times 3$	$tRCIP/7 \times 3.2$	nsec	
Input Data 4	tRIP4	$tRCIP/7 \times 3.8$	$tRCIP/7 \times 4$	$tRCIP/7 \times 4.2$	nsec	
Input Data 5	tRIP3	$tRCIP/7 \times 4.8$	$tRCIP/7 \times 5$	$tRCIP/7 \times 5.2$	nsec	
Input Data 6	tRIP2	$tRCIP/7 \times 5.8$	$tRCIP/7 \times 6$	$tRCIP/7 \times 6.2$	nsec	

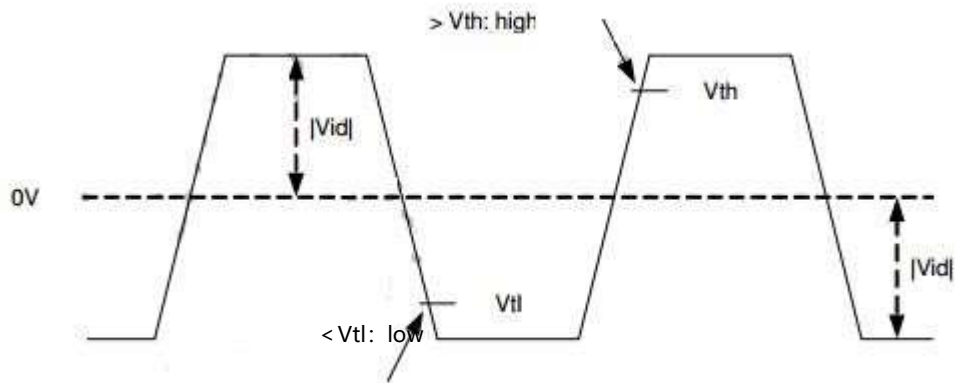


* $V_{diff} = (RX_{z+}) - (RX_{z-}), \dots, (RX_{CLK+}) - (RX_{CLK-})$

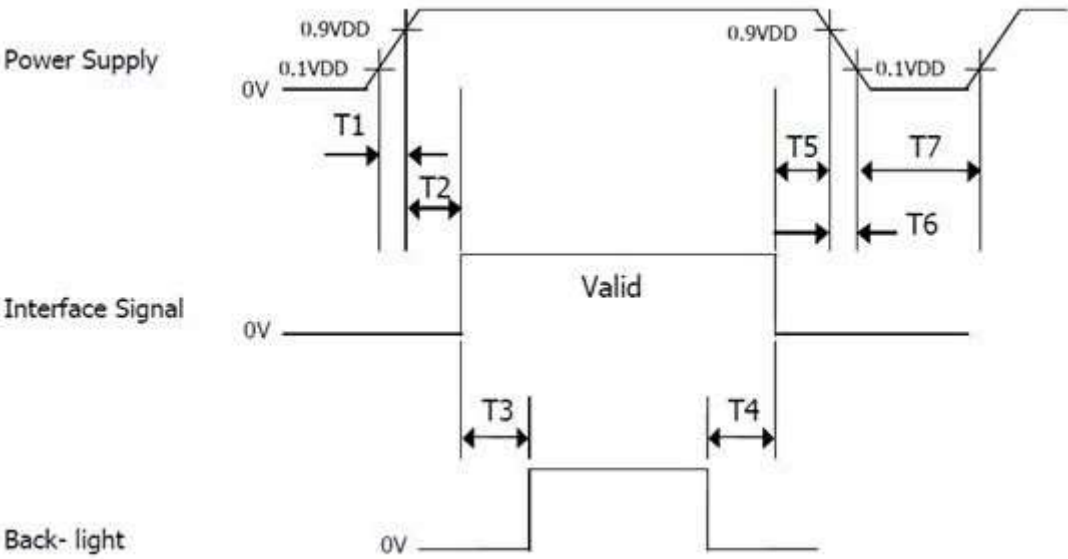
<Table 7. LVDS DC Timing Specification>

Item	Symbol	Condition	MIN	TYP	MAX	Unit
Differential input high Threshold voltage	V_{th}	$V_{cm}=1.2V$	-	-	+0.1	V
Differential input low Threshold voltage	V_{tl}	-	-0.1	-	-	V
Differential input common Threshold voltage	V_{cm}	-	1	1.2	$1.7- V_{id} /2$	V
LVDS input voltage	V_{inlv}	-	0.7	-	1.7	V
Differential input voltage	$ V_{id} $	-	0.35	-	0.6	V
Differential input leakage voltage	I_{lvleak}	-	-10	-	+10	μA

Differential:
 LVCLKP(R)-LVCLKN(R)
 LVD[3:0]P(R)-
 LVD[3:0]N(R)

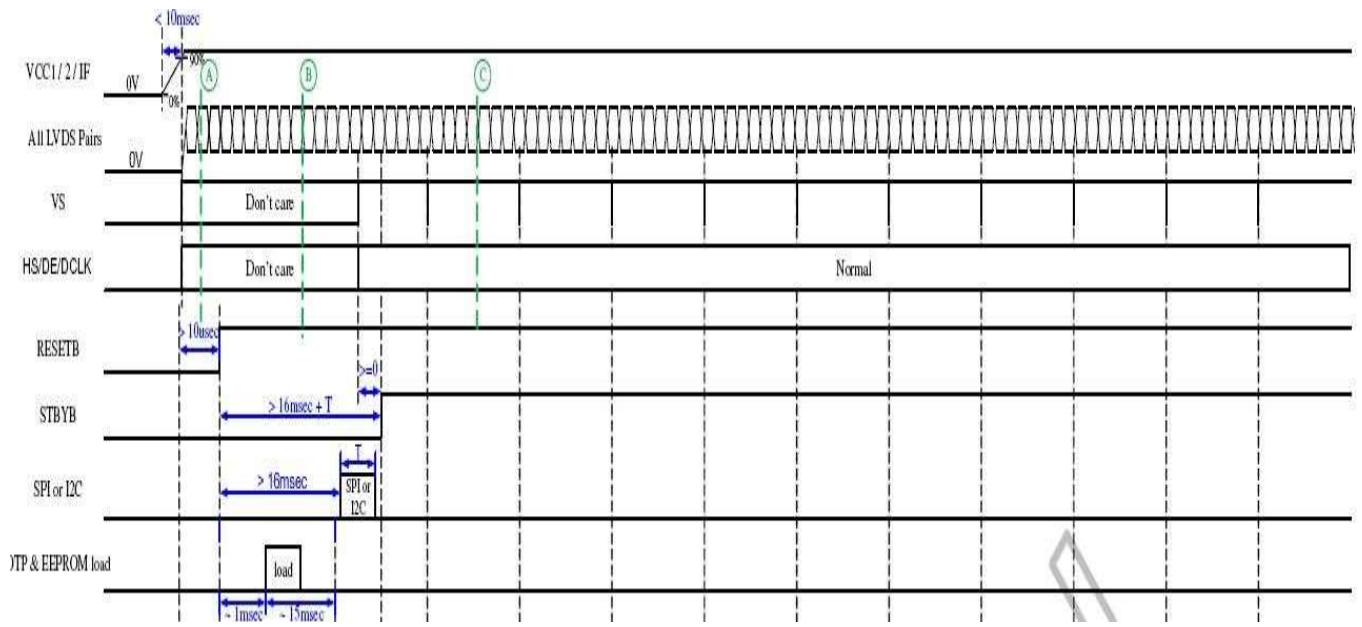


3.4 Power Sequence



< Table8. Sequence Table >

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



4.0 OPTICAL SPECIFICATIONS

4.1 Overview

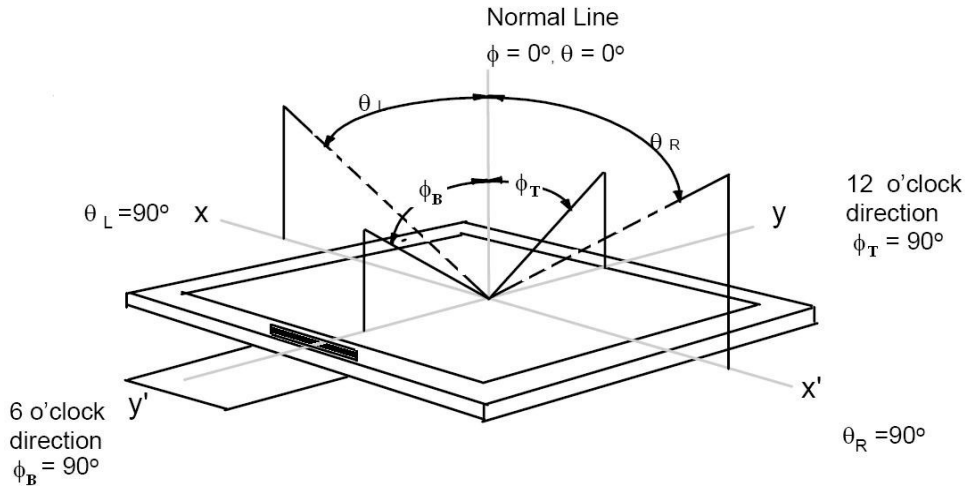
The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Gonio meter system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . We refer to $\theta\Phi = 0$ ($=\theta 3$) as the 3 o' clock direction (the "right"), $\theta\Phi = 90$ ($=\theta 12$) as the 12 O' clock direction ("upward"), $\theta\Phi = 180$ ($=\theta 9$) as the 9 O' clock direction ("left") and $\theta\Phi = 270$ ($=\theta 6$) as the 6 O' clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the Display surface shall stay fixed.

4.2 Optical Specifications < Table9. Optical Table >

Item	Symbol	Condition	Min	Typ.	Max	Unit
Viewing Angle	θ_L	$Cr \geq 10$	70	80	--	deg
	θ_R		70	80	--	
	ψ_T		70	80	--	
	ψ_B		70	80	--	
Contrast Ratio	Cr	$\theta = 0^\circ$	1300	1500		-
Response Time	Tr+Tf	FF= 0°	--	30	35	ms
Color Coordinate of CIE1931	Rx	$\theta = 0^\circ$	-0.03	0.644	+0.03	-
	Ry			0.344		
	Gx			0.315		
	Gy			0.632		
	Bx			0.157		
	By			0.054		
	Wx			0.285		
	Wy			0.327		
NTSC Ratio	NTSC	CIE1931	--	72	--	%
Polarization Direction of Front Polarizer	PdF	-		0		deg
Polarization Direction of Rear Polarizer	PdR	-		90		deg

Note 1: The definition of Viewing Angle

Refer to the graph below marked by θ and ϕ .



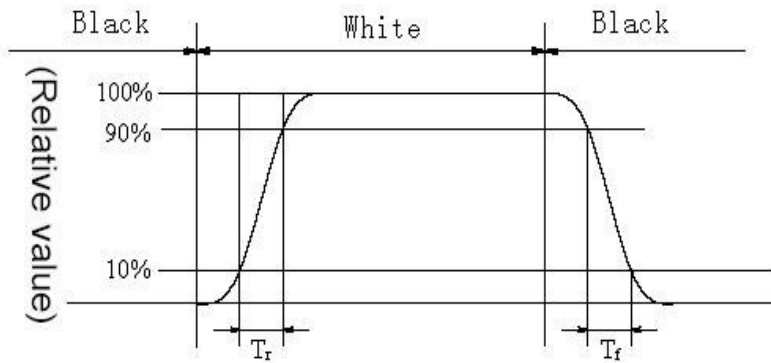
Note2: The definition of Contrast Ratio

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

Note3: Definition of Response time. (Test LCD using RD80S or similar equipment's):

The output sign also photo detector are measured when the input sign also are changed from "black" to "white" (Voltage falling time) and from "white" to "black" (Voltage rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figures below.



Note 4: Color Coordinates of CIE 1931

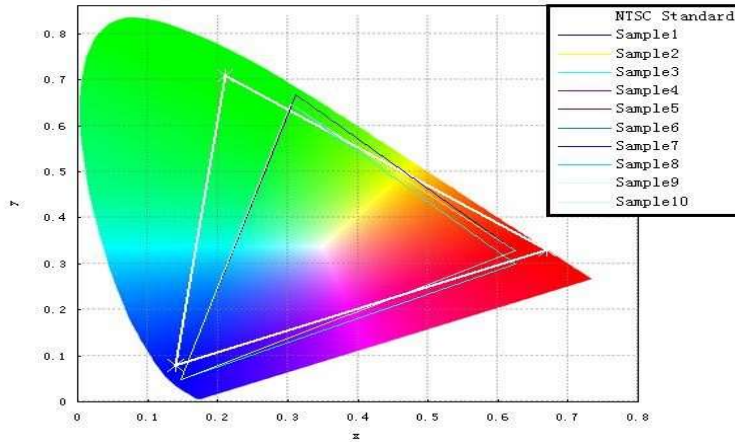
The test condition is at ILED=20mA and measured on the surface of LCD module at 25°C.

Measurement equipment: CS2000 or similar equipment's

The Color Coordinate (CIE 1931) is the measurement of the center of the display shown in below figure.

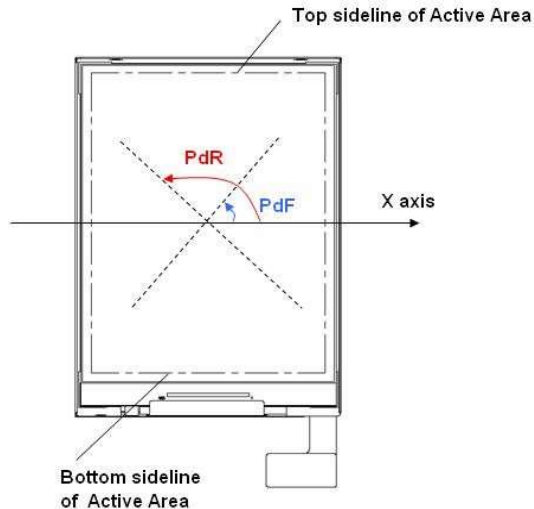
Note 5: Definition of Color of CIE Coordinate and NTSC Ratio.

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$



Note 6: Polarization Direction Definition

- Viewing direction is normal user viewing direction which is vertical to the display surface
- The polarizer which is closer to viewer is defined as Front Polarizer
- The polarizer which is on the rear side of viewer is defined as Rear Polarizer
- The X axis is defined as parallel line to top & bottom sidelines of the Active Area
- PdF which is marked in blue arrow is polarization degree of Front polarizer
- PdR which is marked in red arrow is polarization degree of Back polarizer
- The polarization degree parameter must be indicated in range of 0deg to 180deg according to above definition



5.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

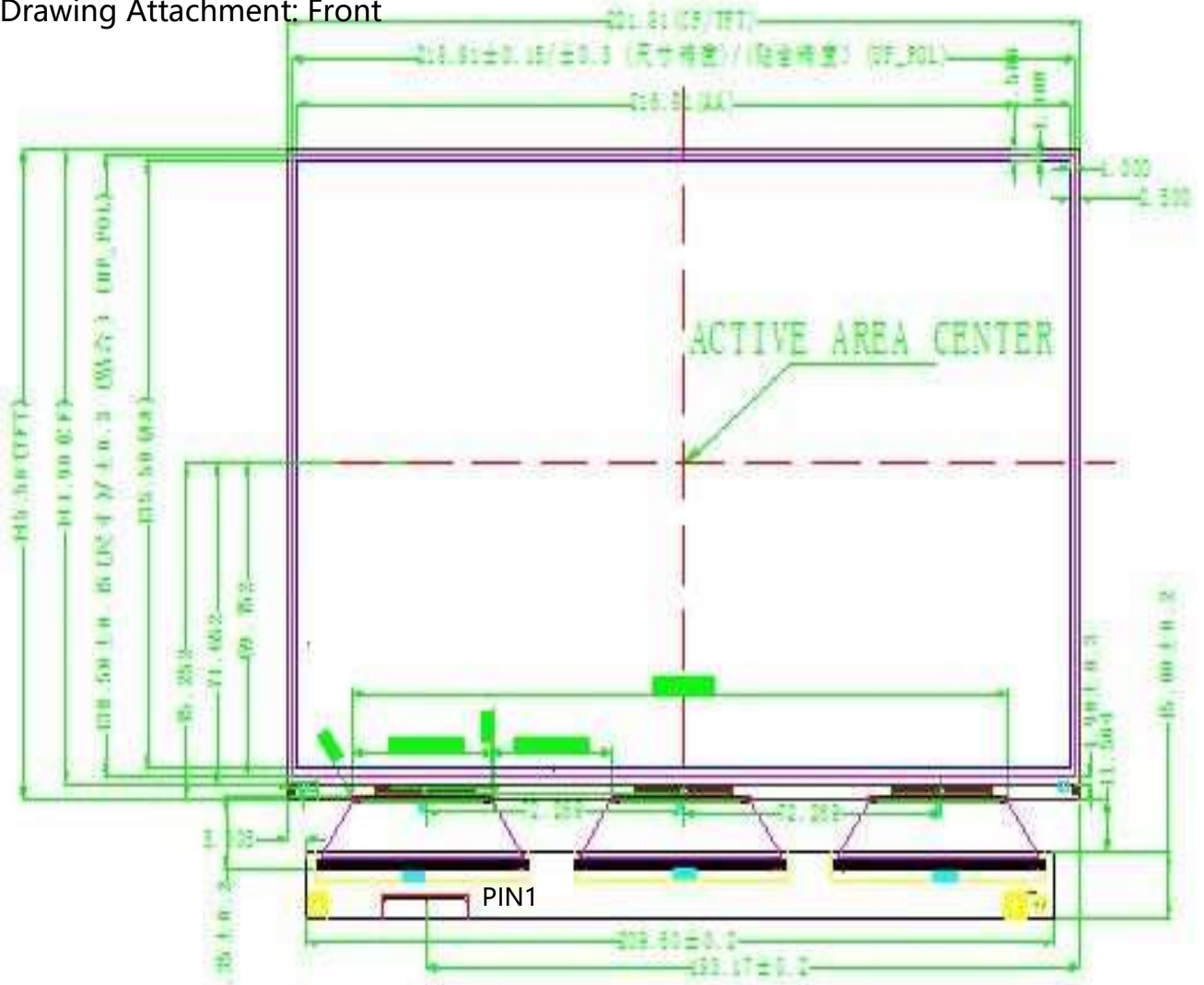
<Table 10. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	85°C 240hr
2	Low temperature storage test	-30°C 240hr
3	Low temperature operation test	-20°C 240hr
4	High temperature operation test	70°C 240hr
5	High temperature & high humidity (operation test)	60°C 90%RH 240hr
6	Thermal Shock Test	-40°C~85°C 0.5hr/cycle 100cycle

6.0 APPENDIX

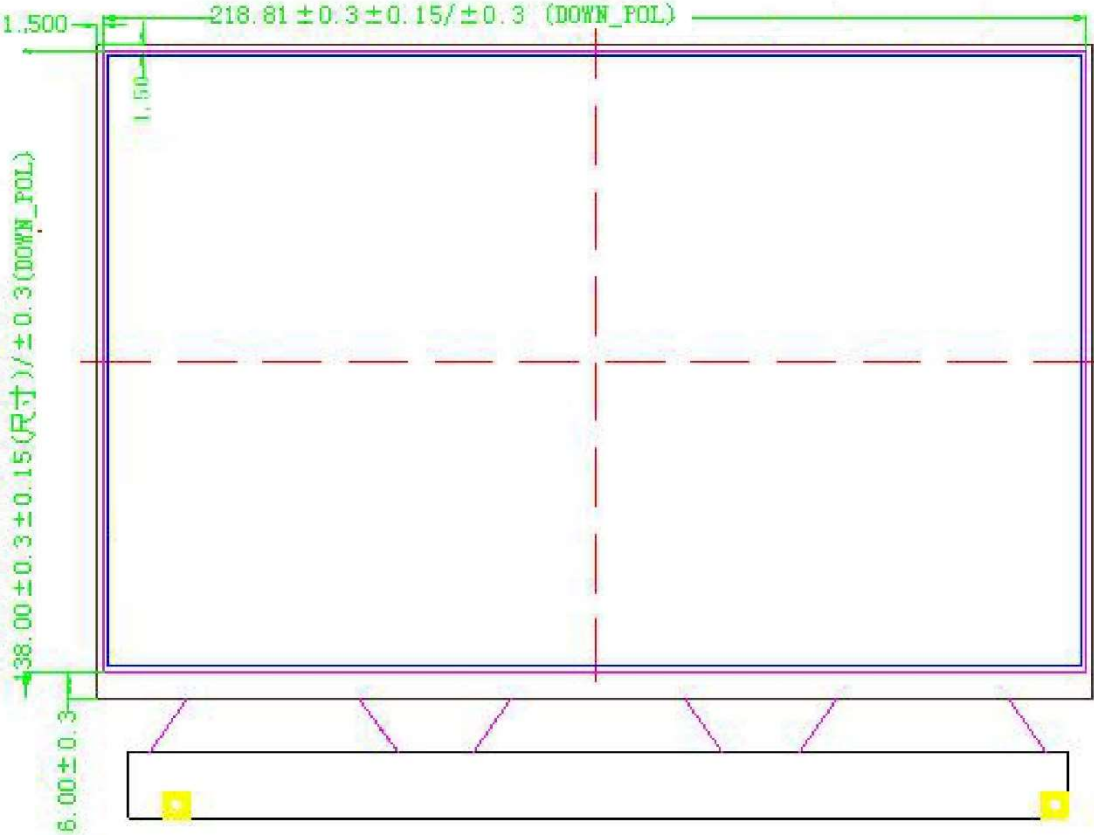
Mechanical Drawing

Drawing Attachment: Front



Mechanical Drawing

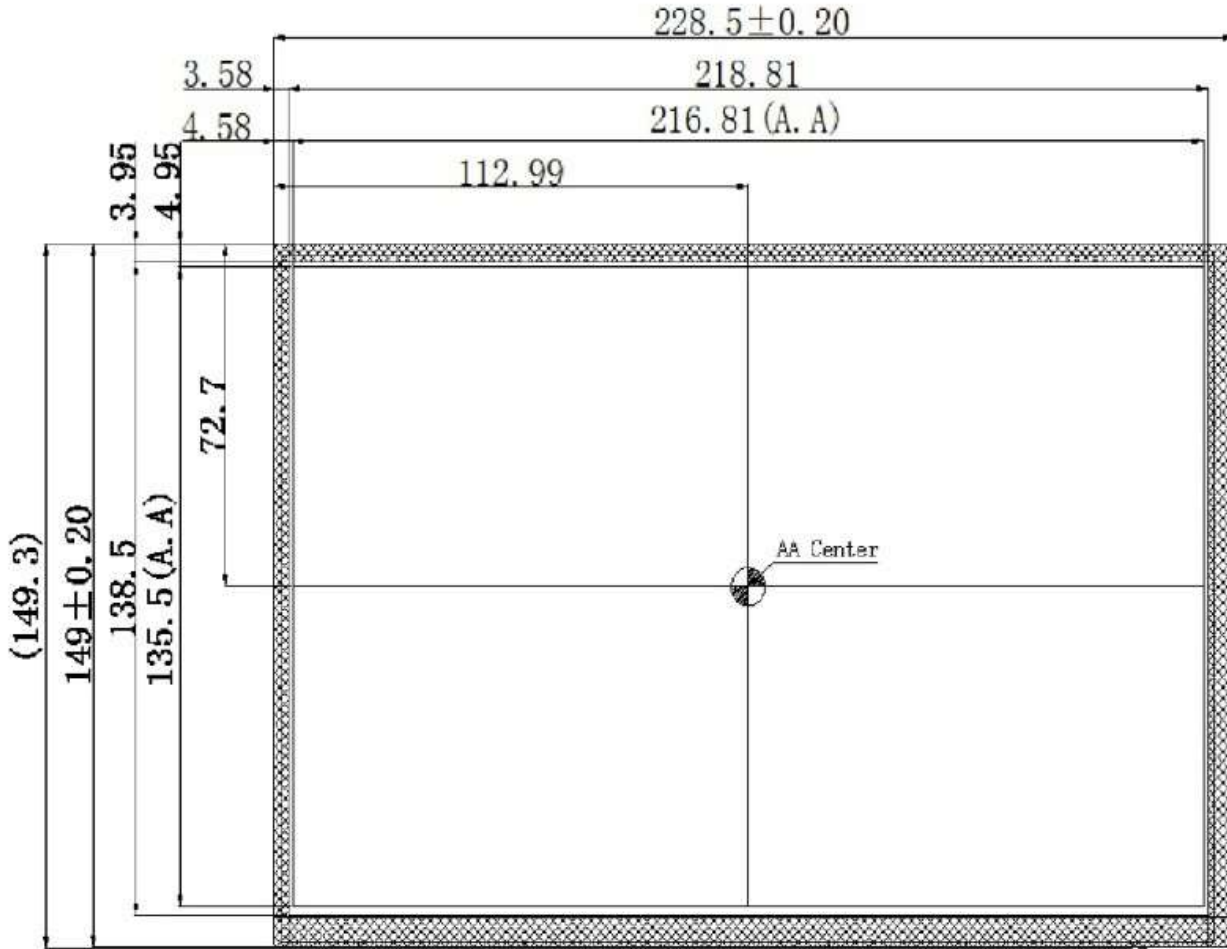
Drawing Attachment: Back



8.0 APPENDIX

Mechanical Drawing

Drawing Attachment: Front



Mechanical Drawing

Drawing Attachment: Back

