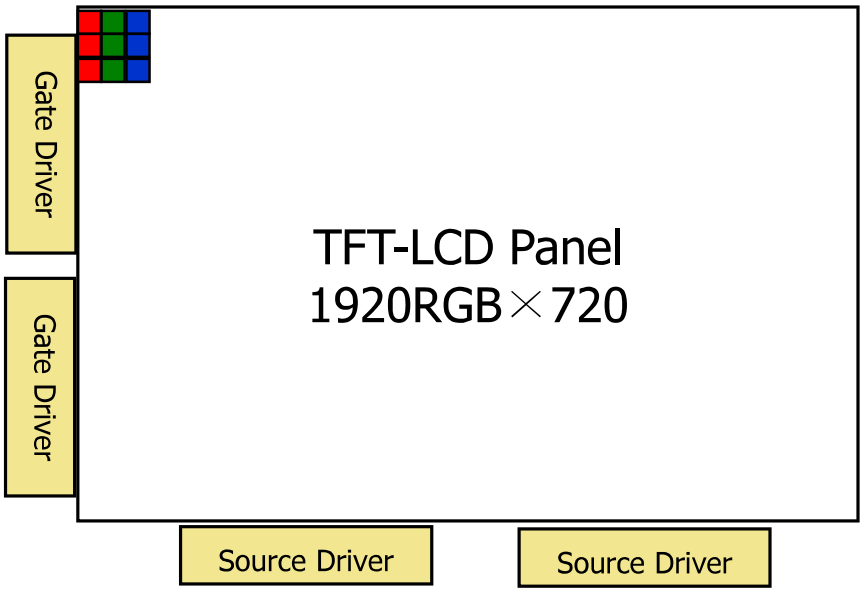
Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

V103Z7M-N13 is a color active matrix TFT LCD Single Cell using amorphous silicon TFT 's (Thin Film Transistors) as an active switching devices. This Single Cell has a 10.25 inch diagonally measured active area with FHD resolutions (1920 horizontal by 720 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

- HADS Model (Normally Black)
- 1920(H) × 720(V)
- Green Product (RoHS & Halogen free product)
- Wide viewing angle (U/D/L/R): 85/85/85/85
- Color Gamut: 75%
- Cell thickness: 1.0t
- LVDS Interface

1.3 Application

- For Vehicle

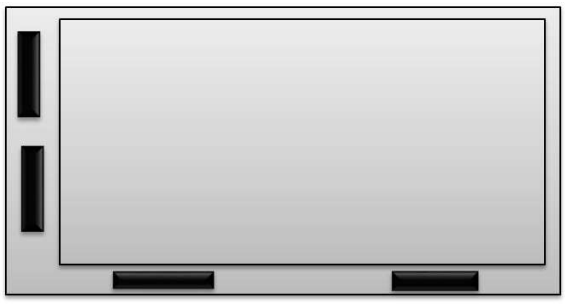
1.4 General Specification

The followings are general specifications at the AV090WVE-N10

<Table1. General Specifications >

Parameter	Specification	Unit	Remarks
Active Area	243.648x91.368	mm	8:3
Number Of Pixels	1920(H) RGB x 720(V)	pixels	PPI：200
Pixel Pitch	0.1269x0.1269	μm	
Module Outline	256.748*107.688	mm	
Thickness	7.1	mm	
Pixel Arrangement	RGB Vertical Stripe		
Display Mode	Normally Black		
Display Colors	16.7M	colors	
Contrast Ratio	1000:1(Typ.)、900:1(Min)	CR	
Viewing Angle(CR>10)	U/D/L/R 85/85/85/85（Min）	°	
Response Time	25（Typ .）、35（Max）	ms	
Color Gamut	75%(Typ.)、70%(Min)	%	
Source IC	2*HX8272-B-LTP	Ea	
Driver IC	2*HX8695-E01-LT	Ea	

Note:
1.At the U/D/L/R direction, the viewing angle is same;
2.The TFT and CF Align Direction;



2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table2. Absolute Maximum Ratings>

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power supply voltage	VDD	-0.3	4.0	V	
Operating Temperature (Humidity)	T_{OP}	-30	+85	℃	
	RH		90	%	At 60°C
Storage Temperature (Humidity)	T_{ST}	-40	+85	℃	
	RH		90	%	At 60°C

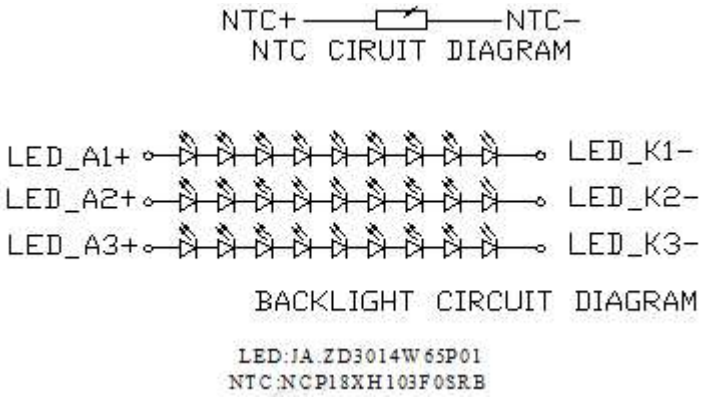
3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table3. Electrical specifications > Ta=25+/-2˚C

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	VDD	3.0	3.3	3.6	V	
Power Supply Input Current(White pattern)	Idd	385	480	575	mA	
Inrush Current	Iinrush		2	3	A	
TFT Gate ON Voltage	VGH	17	18	19	V	
TFT Gate OFF Voltage	VGL	-13	-12	-11	V	
TFT Common Electrode Voltage	VCOM	-	-1.35	-	V	
Supply current of LED backlight	Per string	-	80	-	mA	9 LED
Total Supply current of LED Backlight	I_{LED}Total	-	240	-	mA	3 strings
Supply voltage of LED backlight	Per string	23.4	27	30.6	V	3 strings

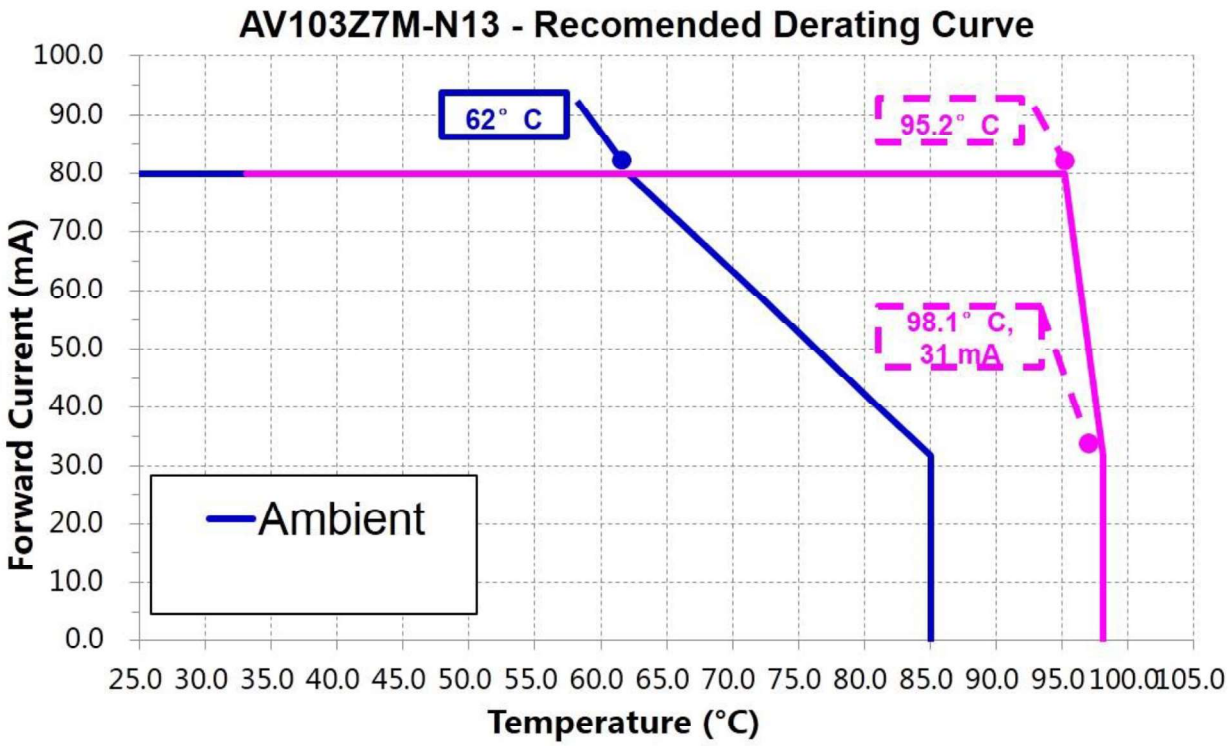
Notes :
1: AVDD should be set to satisfy the characteristic of LC .
2: VGH should be set to satisfy charging ratio of TFT pixel.
3 : VCOM should be adjusted to make the flicker level be minimum and optimize display quality.
4: Frame rate=60HZ
5: BLU LED : 灯共27颗, 3并9串,电流值 240mA, 每串80mA.



LED&NTC Diagram

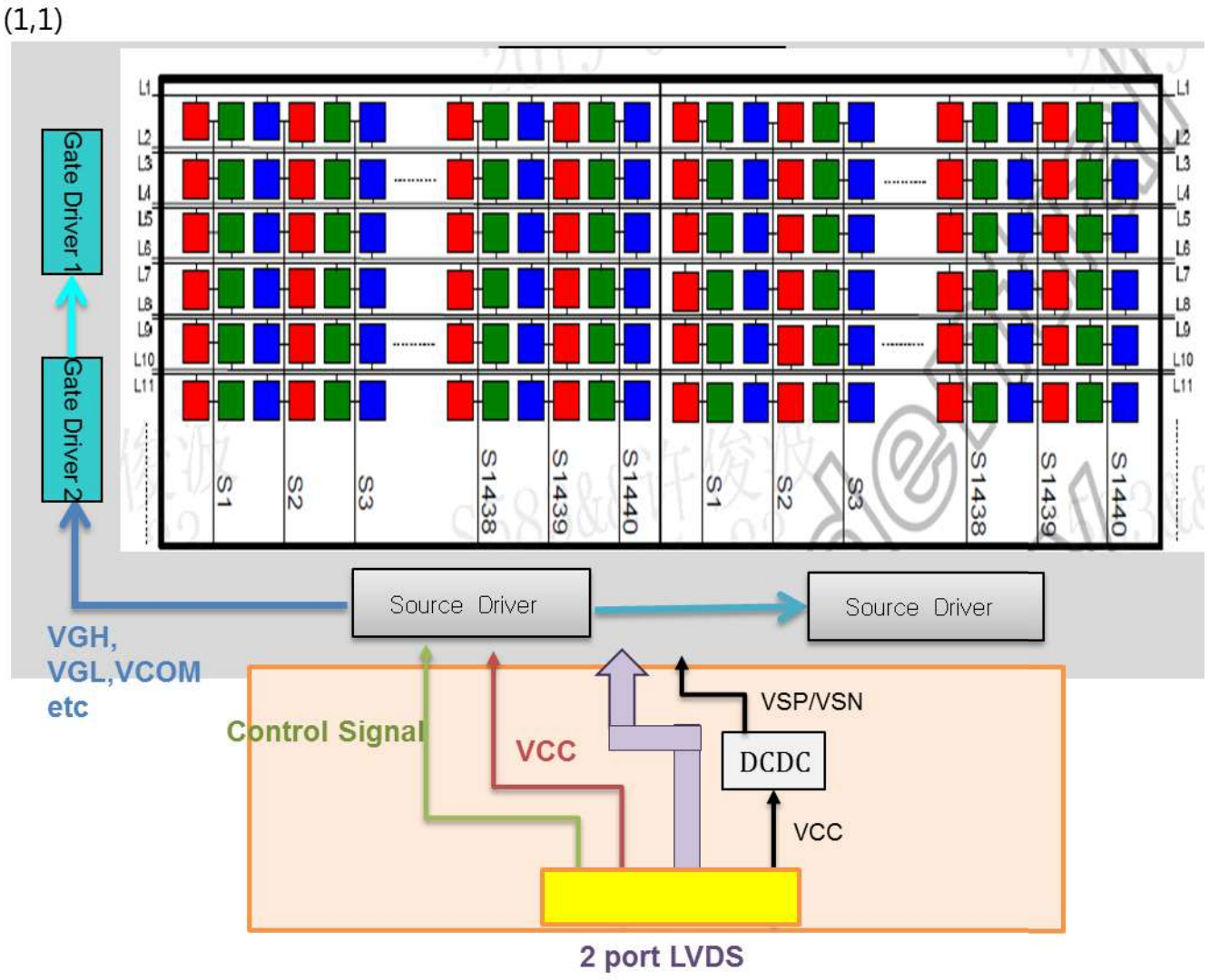
Notes :

6: The derating curve for the backlight estimate as below.. The following chart is based on only LCD module level without customer system.



3.2 INTERFACE CONNECTION

3.2.1 Block diagram



3.2.2 INPUT I/F Pin map

Signal Interface Connector model: **FH28-50S-0.5SH (HRS)**

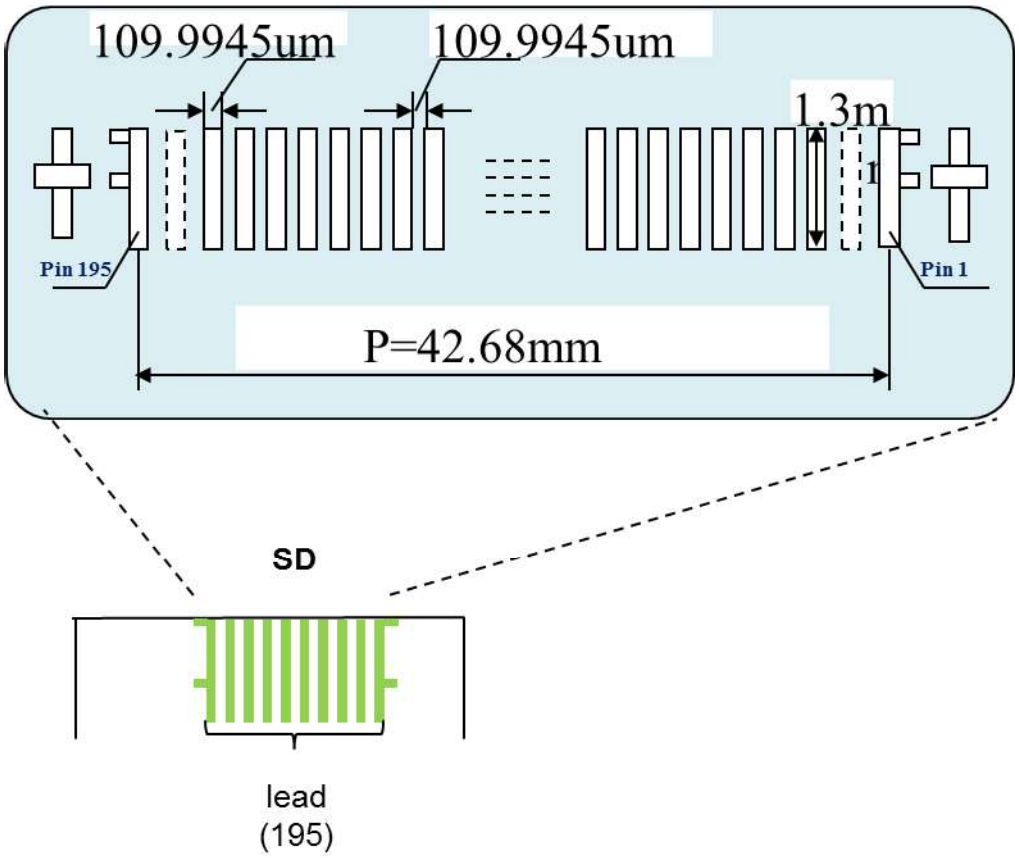
< Table4. INPUT I/F Pin map>

Pin NO.	Symbol	Description	Pin NO.	Symbol	Description
1	GND	Ground	16	ECLKN	LVDS Even Clock channel -
2	VCC	Power	17	ECLKP	LVDS Even Clock channel +
3	VCC	Power	18	GND	Ground
4	VCC	Power	19	ELV3N	LVDS Even Data channel 3 -
5	VCC	Power	20	ELV3P	LVDS Even Data channel 3 +
6	GND	Ground	21	GND	Ground
7	ELV0N	LVDS Even Data channel 0 -	22	OLV0N	LVDS Odd Data channel 0 -
8	ELV0P	LVDS Even Data channel 0 +	23	OLV0P	LVDS Odd Data channel 0 +
9	GND	Ground	24	GND	Ground
10	ELV1N	LVDS Even Data channel 1 -	25	OLV1N	LVDS Odd Data channel 1 -
11	ELV1P	LVDS Even Data channel 1 +	26	OLV1P	LVDS Odd Data channel 1 +
12	GND	Ground	27	GND	Ground
13	ELV2N	LVDS Even Data channel 2 -	28	OLV2N	LVDS Odd Data channel 2 -
14	ELV2P	LVDS Even Data channel 2 +	29	OLV2P	LVDS Odd Data channel 2 +
15	GND	Ground	30	GND	Ground
31	OCLKN	LVDS Odd Clock channel -	41	CSB	Serial Interface chip enable signal
32	OCLKP	LVDS Odd Clock channel +	42	SDA	SPI Data pin
33	GND	Ground	43	ATREN	Enable auto reload signal
34	OLV3N	LVDS Odd Data channel 3 -	44	VOTP	OTP voltage
35	OLV3P	LVDS Odd Data channel 3 +	45	GND	Ground
36	GND	Ground	46	LR	H:Left->Right (Default) L:Right->Left
37	RESET	reset	47	TB	H:Top->Bottom(Default) L:Bottom->Top
38	STBYB	Standy mode setting pin,Active low	48	NC	No connection
39	GND	Ground	49	FAULT	Output for fail detection
40	SCL	SPI Clock pin	50	NC	No connection

3.2.3 FPC OLB Pad Design

Pad pin :195pin， Pad pitch： 0.21989um，Lead : Space = 1: 1

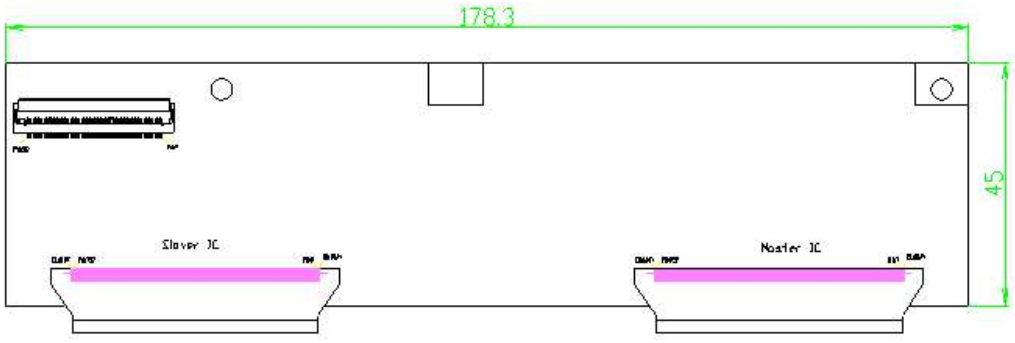
OLB on panel lead pitch: 220um， Lead : Space= 140:80 um



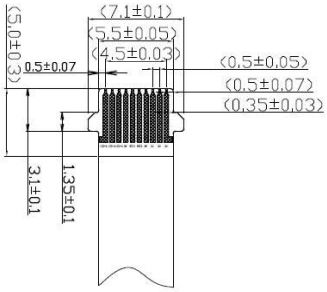
3.2.4 PCB Board Design

2个FOB中线距离108.13mm

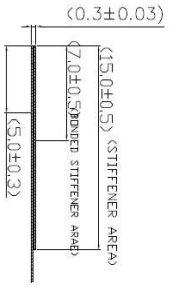
PCB金手指按照PCB中心做整体预缩，预缩量400ppm

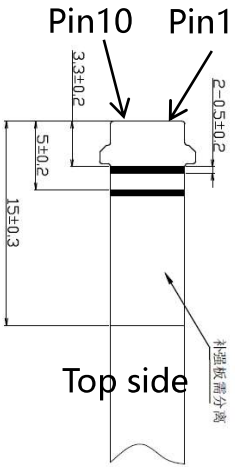


3.2.5 LED Pin Design(Connector:196415-10041-36(P-TWO))



Bottom side





Top side

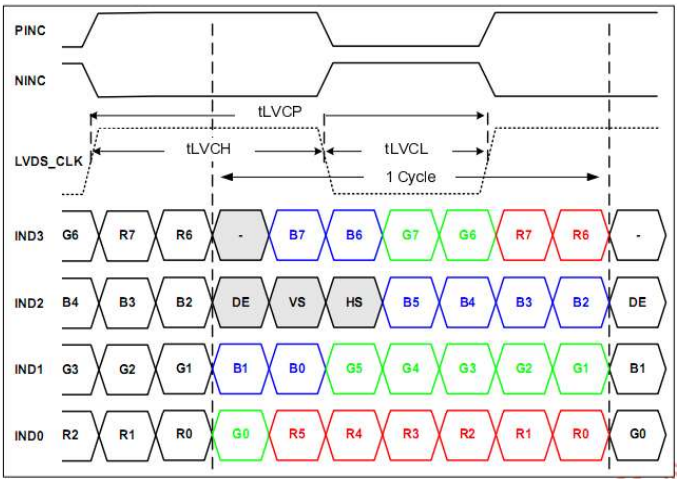
LED Connector Pin map

LED CNT PIN MAP	
1	LED-A
2	LED-A
3	LED-A
4	NC
5	NTC1
6	NTC2
7	NC
8	LED-K1
9	LED-K2
10	LED-K3

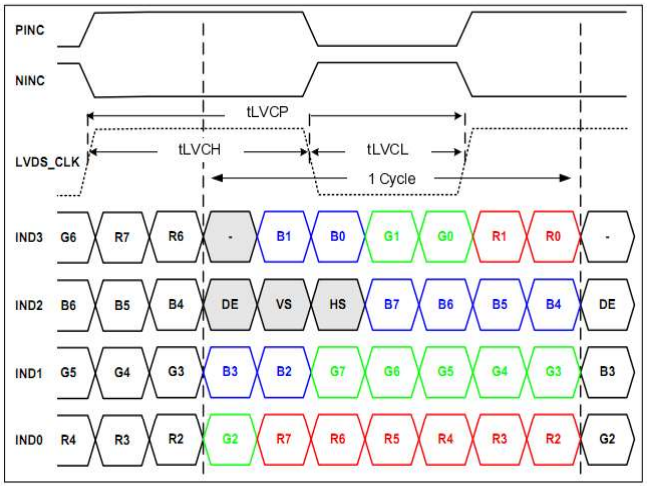
3.3 LVDS Connection Design

3.3.1 LVDS Data map

LVDS采用VESA mode



VESA mode



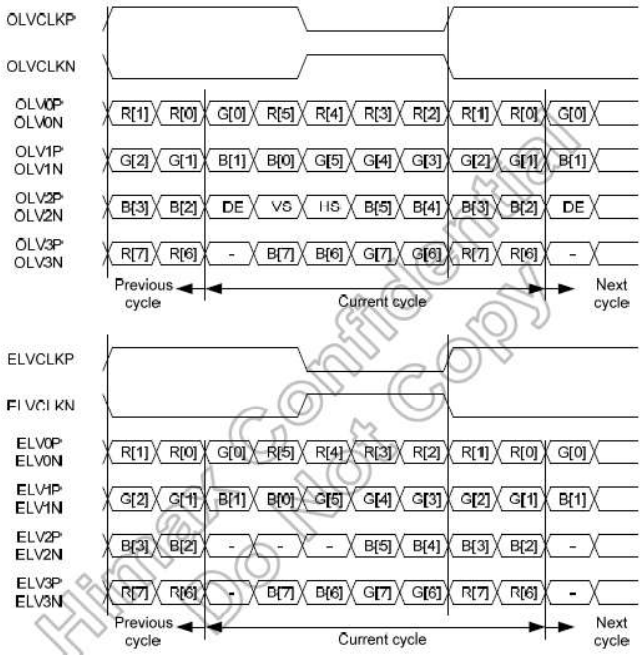
JEIDA mode

3.3.2 LVDS Signal Timing

< Table5. LVDS Signal Timing>

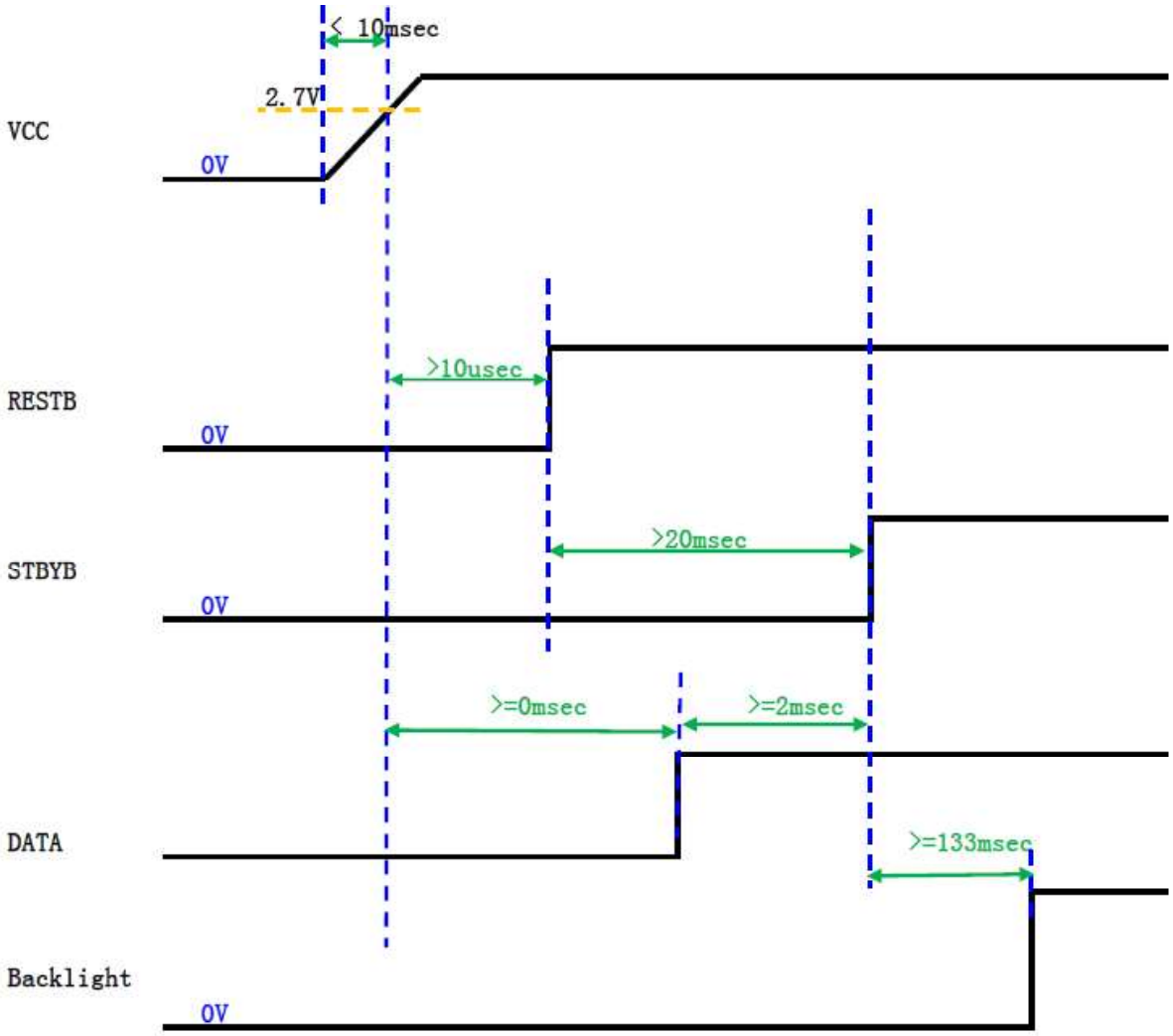
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	RxFCLK	44.5	47.06	50	MHz	
Horizontal Display Area	thd		960		DCLK	
HS Period	th	1015	1032	1440	DCLK	
HS Blanking	Thb+thfp	55	72	480	DCLK	
Vertical Display Area	tvd		720		TH	
VS Period	tv	728	760	1080	TH	
VS Blanking	Tvbp+tvfp	8	40	360	TH	
Clock high time	TLVCH	12.84	12.14	11.4	ns	
Clock low time	TLVCL	9.63	9.11	8.6	ns	

3.3.3 LVDS Signal Format

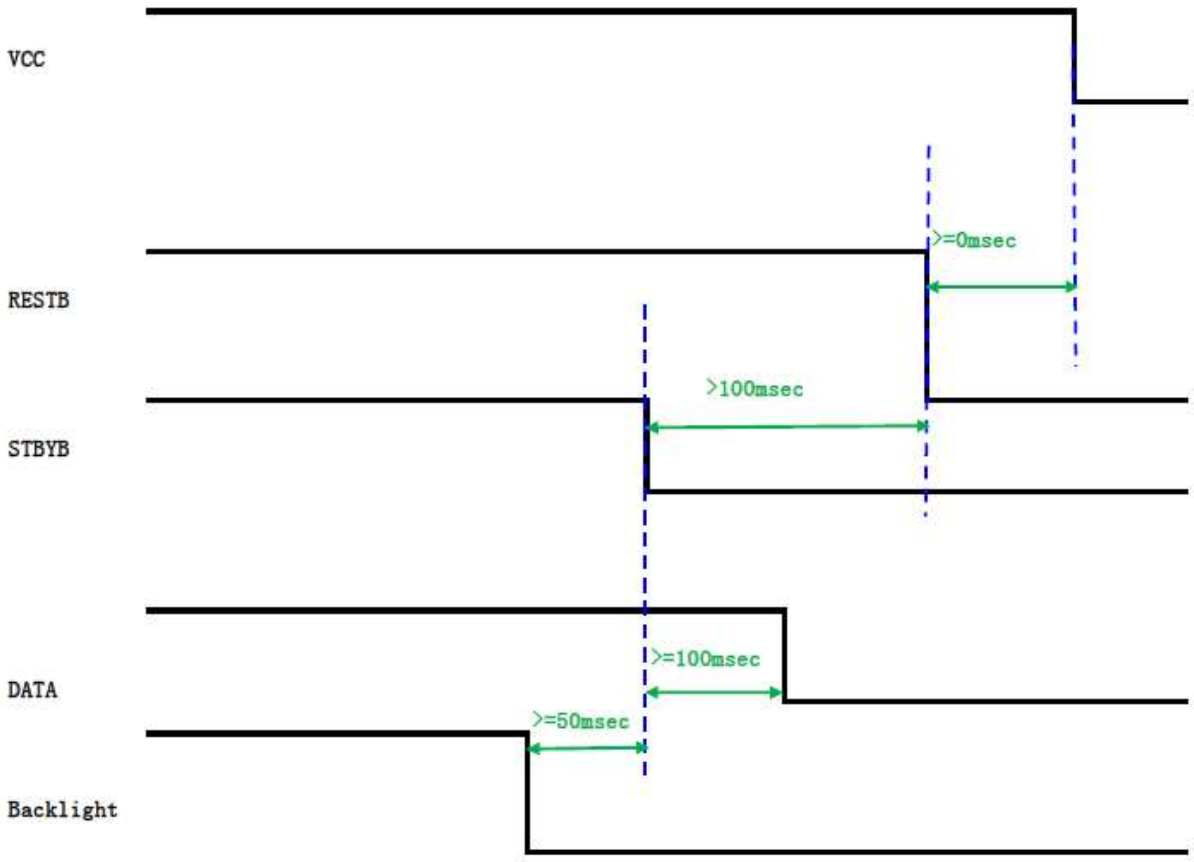


3.4 POWER ON/OFF SEQUENCE

3.4.1 POWER ON SEQUENCE



3.4.2 POWER OFF SEQUENCE



4.0 OPTICAL SPECIFICATIONS

4.1 Overview

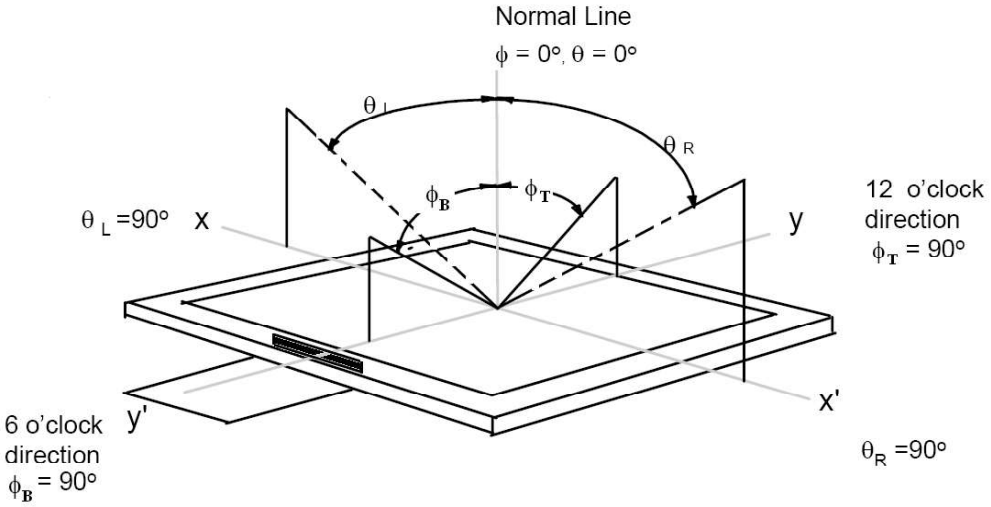
The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Gonio meter system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ =0 (=θ3) as the 3 o′ clock direction (the "right"), θØ=90 (= θ12) as the 12 O′ clock direction ("upward"), θØ=180 (= θ9) as the 9 O′ clock direction ("left") and θØ=270(= θ6) as the 6 O′ clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed.

4.2 Optical Specifications

< Table6. Optical Table >

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note
Viewing Angle	CR>10	U	85	-	-	deg	Note 1
		D	85	-	-		
		L	85	-	-		
		R	85	-	-		
Contrast Ratio	CR	θ=0° FF=0°	900： 1	1000： 1	-	-	Note 2
Response Time	Tr+Tf	Tp=25deg	-	25	35	ms	Note 3
		Tp=-20deg	-	-	250		
		Tp=-30deg	-	-	600		
Color Coordinate of CIE1931	Rx	θ=0°	Typ-0.03	0.645	Typ+0.03	-	Note 4
	Ry			0.337			
	Gx			0.317			
	Gy			0.627			
	Bx			0.146			
	By			0.063			
	Wx			0.304			
	Wy			0.327			
NTSC Ratio	NTSC	CIE1931	70	75	-	%	Note 5
Luminance Uniformity	ΔY	L0	50	-	-	%	Note 6
		L255	75	-	-		
Luminance	-	L255	700	850	-	nit	-
Flicker	25℃	dot inversion	-	-	-20	dB	Note 7
Gamma	25℃	vertical direction	1.9	2.2	2.5	-	Note 8
Crosstalk	-	-35~80℃	-	-	2.0	%	Note 9
Reflectance Ratio	-	SCI	-	-	6	%	Note 10

Note 1:**The definition of Viewing Angle**
Refer to the graph below marked by θ and Φ.

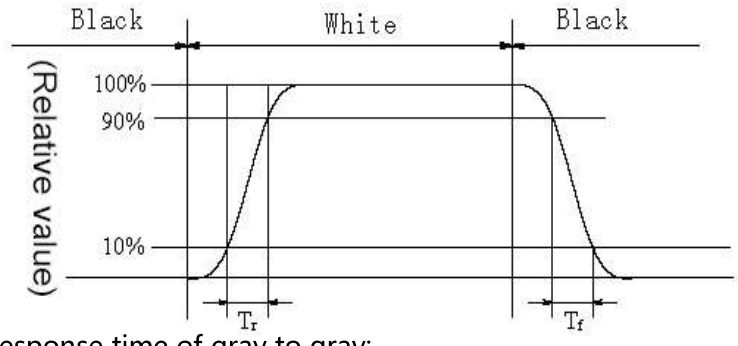


Note2:**ThedefinitionofContrastRatio** (Test LCM using CS2000 or similar equipments):

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

(Contrast Ratio is measured in optimum common electrode voltage)

Note3: DefinitionofResponse time.(Test LCD using DMS501 or similar equipments):
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 fi gures below.



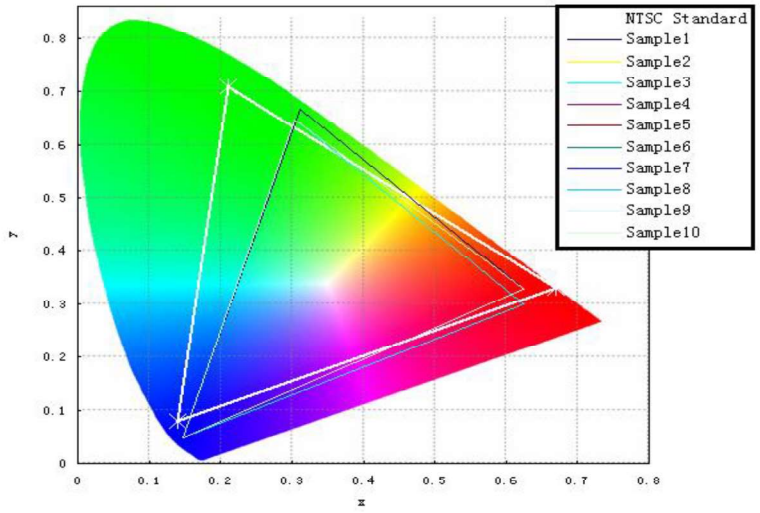
	L0	L1	L2	L3	L4	L5	L6	L7
L0	■							
L1		■						
L2			■					
L3				■				
L4					■			
L5						■		
L6							■	
L7								■

Response time of gray to gray:
Measurement equipment: DMS501 or similar equipments.
Test method: we define 8 grays L0-L7,the grays of L0-L7 were defined as:0,36,73, 109, 146, 182, 219, 25 5. Theoutputsignalsofphotodetectoraremeasuredwhentheinputsignalsarechanged from "Lx" to "Ly" , x, y= [0, 7]. The response time is defined as the time interval between the 10% and 90% of amplitudes. The result of the test can be noted as 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℃.
Measurement equipment:CS2000 or similar equipments
The Color Coordinate (CIE 1931) is the measurement of the center of the display shown in below figure.

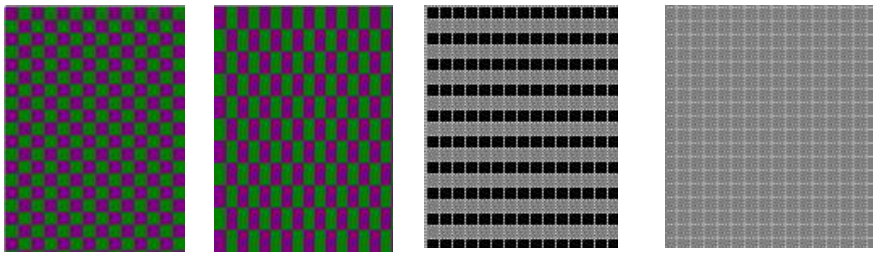
Note 5: Definition of Color of CIE Coordinate and NTSC Ratio.

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



Note 6: The luminance uniformity on LCD surface is then expressed as :
ΔY = (Minimum Luminance of 9points / Maximum Luminance of 9points) * 100.

Note 7: Flicker
- Measurement equipment :CA-210 or similar equipments
- Measuring temperature: Ta=25℃.
- Test method: JEITA method
- Test pattern : Refer to below(Test Pattern should be full-fill of display screen)



1 Dot Inversion, 2 Dot Inversion , Line Inversion , Frame Inversion
The point should be marked is, for line and frame inversion, the background of Flicker Test Pattern
- "gray " are defined as middle gray scale .For example, RGB 24bit "gray" defined as below:

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

For Dot inversion, the RGB data for first pixel is (127, 0, 127), the RGB data for the second pixel is (0, 127 , 0).

●Frame Frequency Requirement before test： The LCD must be tuned to more than 65HZ before measu rement.

●Measurement Point: the center of display active area

●Conversion of Flicker ratio:

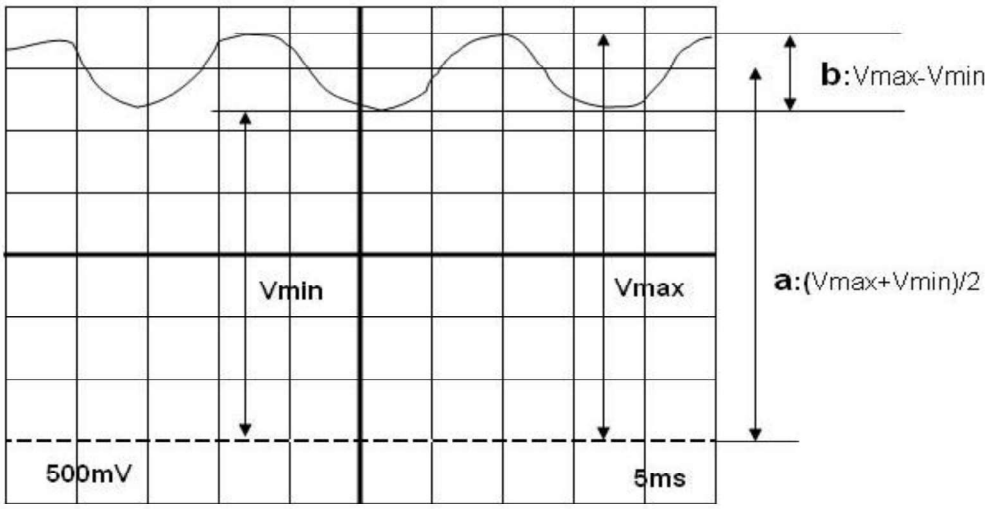
Flicker [dB] = 10 x log[Px/P0]

Where

Px: Maximum power spectrum of AC component after passing through integrator

P0: Power spectrum of DC component after passing through integrator

AC component=b (Refer to below diagram)



Note 8: gamma curve control

●For gamma curve control, HUAWEI’ s request as below:

●1,the whole curve’ s tolerance must control within +/-0.3, HUAWEI will test the gray scale below: 0, 8, 16, 25, 33, 41, 49, 58, 66, 74, 82, 90, 99, 107, 115, 123, 132, 140, 148, 156, 165, 173, 181, 189, 19 7,206, 214, 222, 230, 239, 247, 255

Note 9:Crosstalk

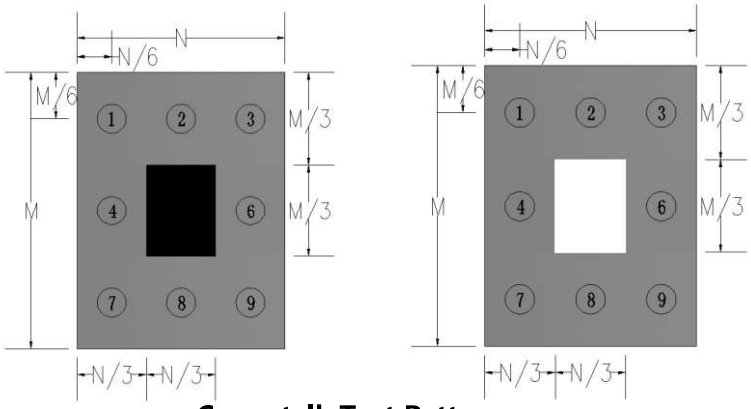
●There should be no visible cross-talk in normal direction of the display when the two ” Cross-talk Test Patterns ” below are loaded.

●Measurement equipment:CS2000 or similar equipments

●The point should be marked is, the background of Cross-talk Test Pattern- “gray ” are defined as middle gray scale . For example, RGB 24bit “gray” defined as below:

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

●▵Bpn = Bpn (gray) / Bpn (white)
Which n means the dot No. In the Cross-talk Test Pattern ;
Bpn (gray) means the brightness of the No.n spots in Cross-talk Test Pattern;
Bpn (white) means the brightness of the No.n spots in Full white Test Pattern;
●▵Bp (Max.) = Maximum value in ▵Bp1~▵Bp9, except the No. 5 spot.
●▵Bp (Min.) = Minimum value in ▵Bp1~▵Bp9, except the No.5 spot.
●▵CT=▵Bp (Max.)/▵Bp(Min.).
●▵CT must be less than 1.10



Cross-talk Test Pattern

Note 10: Reflectance Ratio
●Measurement equipment : X-rite SP64
●Measurement parameter： Reflectance Ratio @550nm