碩 擇 實 業 股 份 有 限 公 司
GOOD CHOICE ENTERPRISE CO., LTD

Disea Electronics Co., LTD

TO：瞻營全電子股份有限公司

DATE：AUG.08-2019

TFT LCM

ZW-T090BAE-02

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
YGM	*Tim*		*Paul*

客戶確認：

Disea Electronics Co., LTD

PRODUCT SPECIFICATIONS

For Customer: _____   ☐ : APPROVAL FOR SPECIFICATION

Customer Model No. _____   ☐ : APPROVAL FOR SAMPLE

Module No.: ___ZW-T090BAE-02___   ___Date : 2019-08-08___

Table of Contents

For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
YGM	*Tim*		*Paul*

2. Revision Record

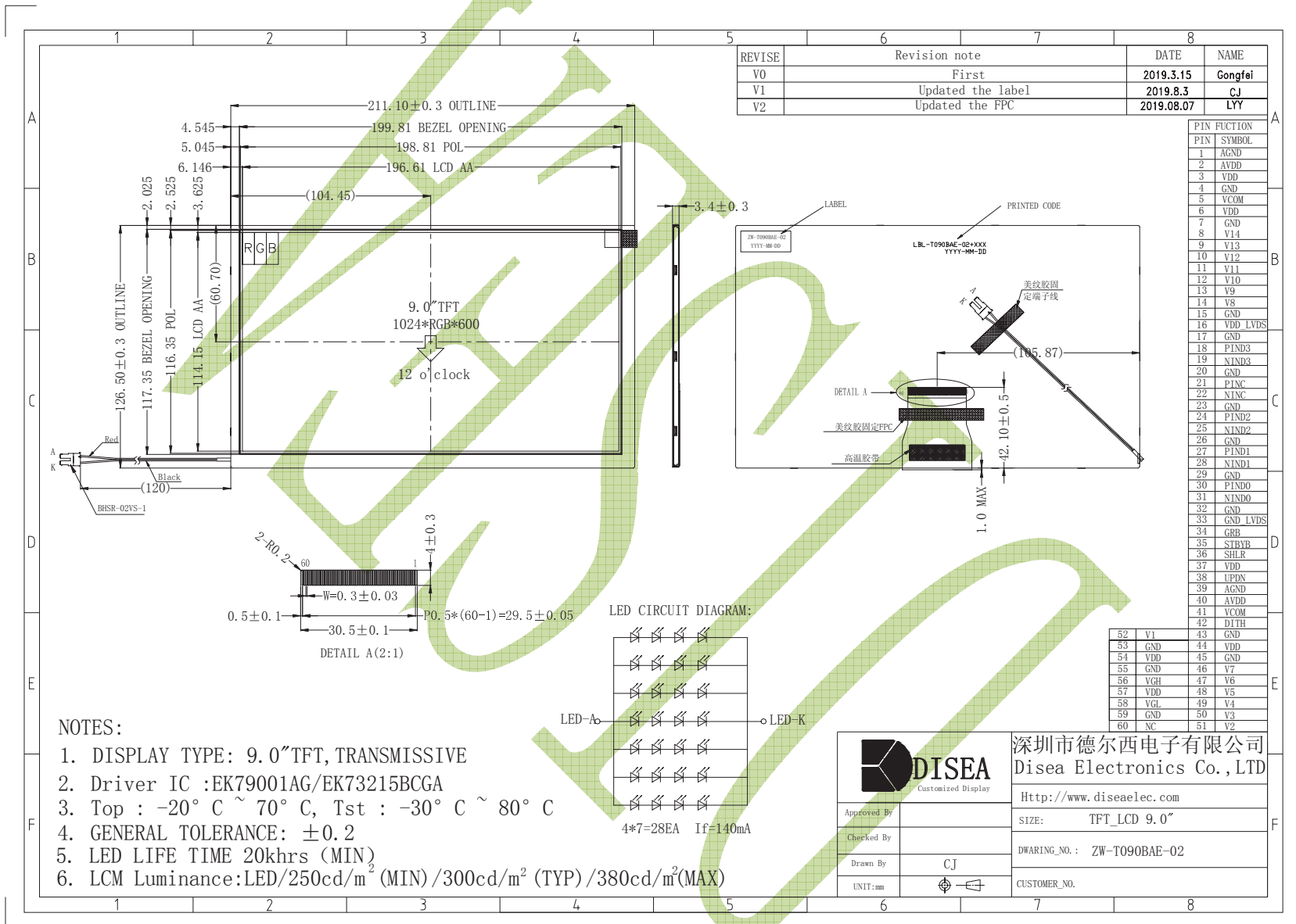| Date	Rev.No.	Page	Revision Items	Prepared
2019-07-30	V0		The first release	YGM
2019-08-08	V1		Updated Item #4	CJ Jiang

3. General Specifications

ZW-T090BAE-02 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC,a back light unit. The 9.0″ display area contains 1024x(RGB)x600 pixels and can display up to 16.7M colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	16.2M	-	1
Viewing Direction	12	O'Clock	
Gray scale inversion direction	6	O'Clock	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	211.10X126.50X3.4	mm	2
Active Area(W×H)	196.61x114.15	mm	
Number of Dots	1024×600	dots	
TFT Controller	EK79001AG+EK73215BCGA	-	
CTP driver	NA	-	
Power Supply Voltage	3.3	V	
Backlight	4S7P-LEDs (white)	pcs	
Weight	185	g	
Interface	LVDS	-	

Note 1:   Color tune is slightly changed by temperature and driving voltage.
Note 2:   Without FPC ，Wire and Solder.

Disea Electronics Co., LTD

4.Outline Drawing

REVISE	Revision note	DATE	NAME
V0	First	2019.3.15	Gongfei
V1	Updated the label	2019.8.3	CJ
V2	Updated the FPC	2019.08.07	LYY

Dimensions (left of display):
- 211.10±0.3 OUTLINE
- 199.81 BEZEL OPENING
- 198.81 POL
- 196.61 LCD AA
- (104.45)
- 4.545
- 5.045
- 6.146
- 2.025
- 2.525
- 3.625
- 126.50±0.3 OUTLINE
- 117.35 BEZEL OPENING
- 116.35 POL
- 114.15 LCD AA
- (60.70)
- RGB
- 9.0″TFT
- 1024*RGB*600
- 12 o'clock
- 3.4±0.3

Red
Black
(120)
BHSR-02VS-1
A K

DETAIL A(2:1):
- 2-R0.2
- 60
- 1
- 4±0.3
- W=0.3±0.03
- 0.5±0.1
- 30.5±0.1
- P0.5*(60-1)=29.5±0.05

LABEL
ZW-T090BAE-02
YYYY-MM-DD

PRINTED CODE
LBL-T090BAE-02+XXX
YYYY-MM-DD

美纹胶固
定端子线
A K
DETAIL A
美纹胶固定FPC
高温胶带
(105.87)
42.10±0.5
1.0 MAX

PIN FUCTION

PIN	SYMBOL		PIN	SYMBOL
1	AGND			
2	AVDD			
3	VDD			
4	GND			
5	VCOM			
6	VDD			
7	GND			
8	V14			
9	V13			
10	V12			
11	V11			
12	V10			
13	V9			
14	V8			
15	GND			
16	VDD_LVDS			
17	GND			
18	PIND3			
19	NIND3			
20	GND			
21	PINC			
22	NINC			
23	GND			
24	PIND2			
25	NIND2			
26	GND			
27	PIND1			
28	NIND1			
29	GND			
30	PIND0			
31	NIND0			
32	GND			
33	GND_LVDS			
34	GRB			
35	STBYB			
36	SHLR			
37	VDD			
38	UPDN			
39	AGND			
40	AVDD			
41	VCOM			
42	DITH			

PIN	SYMBOL	PIN	SYMBOL
52	V1	43	GND
53	GND	44	VDD
54	VDD	45	GND
55	GND	46	V7
56	VGH	47	V6
57	VDD	48	V5
58	VGL	49	V4
59	GND	50	V3
60	NC	51	V2

LED CIRCUIT DIAGRAM:

LED-A
LED-K
4*7=28EA If=140mA

NOTES:
1. DISPLAY TYPE: 9.0″TFT,TRANSMISSIVE
2. Driver IC :EK79001AG/EK73215BCGA
3. Top : -20° C ~ 70° C, Tst : -30° C ~ 80° C
4. GENERAL TOLERANCE: ±0.2
5. LED LIFE TIME 20khrs (MIN)
6. LCM Luminance:LED/250cd/m^2 (MIN)/300cd/m^2 (TYP)/380cd/m^2(MAX)

DISEA Customized Display

深圳市德尔西电子有限公司
Disea Electronics Co.,LTD

Http://www.diseaelec.com

Approved By		SIZE:	TFT_LCD 9.0″
Checked By			
Drawn By	CJ	DWARING_NO.:	ZW-T090BAE-02
UNIT:mm		CUSTOMER_NO.	

5. Absolute Maximum Ratings(Ta=25℃)

5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	5.0	V	1，2
	AVDD	-0.5	14.85	V	1，2
	VGH	-0.3	+42	V	1，2
	VGL	-20	0.3	V	1，2

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.

2. $V_{DVDD} > V_{SS}$ must be maintained.

3. Please be sure users are grounded when handing LCD Module.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30℃	80℃	-20℃	70℃	1,2
Humidity	-	-	-	-	3

1. The response time will become lower when operated at low temperature.

2. Background color changes slightly depending on ambient temperature.

The phenomenon is reversible.

3. Ta<=40℃:85%RH MAX.

Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.

ILED VS TEMP

6. Electrical Specifications and Instruction Code

6.1 Electrical characteristics(Vss=0V ,Ta=25℃)

Item	Symbol	Min	Typ	Max	Unit	Note
Power supply	VDD	3.0	3.3	3.6	V	
Logic Input voltage	VCM	0.5*|VID|	-	2.4-0.5*|VID|	V	Note1
	|VID|	200	-	600	mV	Note1
	VTH	-	-	100	mV	VCM=1.2V Note1
	VTL	-100	-	-	mV	
Analog Power Supply Voltage	AVDD	10.4	10.8	11.2	V	
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-9	-8	-7	V	
Common Power Supply Voltage	VCOM	3.95	4.25	4.55	V	Note2
Gamma Voltage	V1	-	8.54	-	V	
	V2	-	8.43	-	V	
	V3	-	6.94	-	V	
	V4	-	6.48	-	V	
	V5	-	6.16	-	V	
	V6	-	5.79	-	V	
	V7	-	5.70	-	V	
	V8	-	3.32	-	V	
	V9	-	3.22	-	V	
	V10	-	2.66	-	V	
	V11	-	2.25	-	V	
	V12	-	1.75	-	V	
	V13	-	0.27	-	V	
	V14	-	0.22	-	V	

Note: 1: LVDS signal
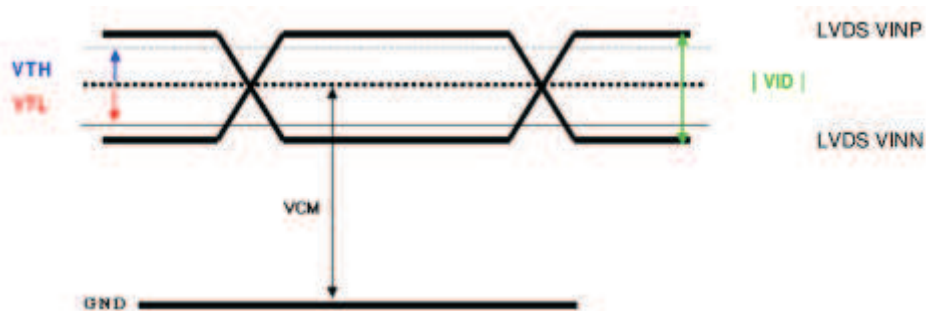
Note: 2: Please adjust VCOM to make the flicker level be minimum.

6.2 LED backlight specification(VSS=0V ,Ta=25℃)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V_f	If=140mA	10.8	13.2	14.4	V	
Uniformity	△Bp	If=140mA	75	80	-	%	
Life Time	time	If=140mA	20K	-	-	hours	1
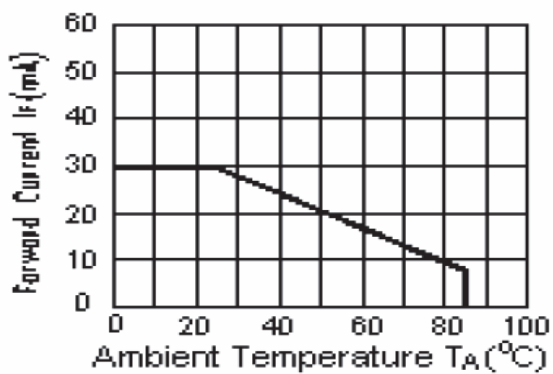
Note 1:   Brightness to be decreased to 50% of the initial value at ambient temperature TA=25 ℃

6.3 input Timing table

6.3.1 Timing Specification

ITEM				SYMBOL	MIN	TYP	MAX	UNIT
LVDS input signal sequence	CLK Frequency			tclk	45	51.2	57	MHz
LCD input signal sequence（Input LVDS Transmitter）	DENA	Horizontal	Horizontal total Time	t_H	1324	1344	1364	tCLK
			Horizontal effective Time	t_{HA}		1024		tCLK
			Horizontal Blank Time	t_{HB}	300	320	340	tCLK
		Vertical	Vertical total Time	t_V	625	635	645	t_H
			Vertical effective Time	t_{VA}		600		t_H
			Vertical Blank Time	t_{VB}	25	35	45	t_H

6.3.2 *LVDS Input Data mapping*
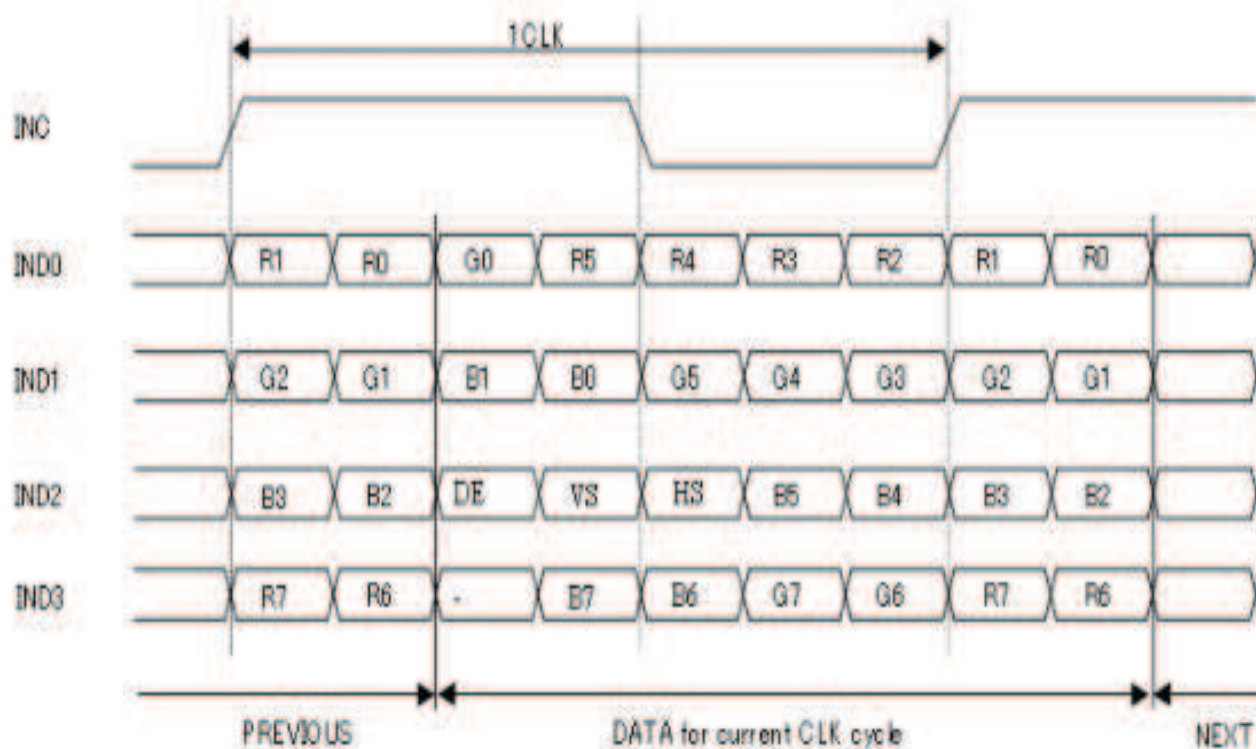
6.4 AC Characteristics

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Clock Frequency	RxFCLK		20	-	71	MHz
Input data skew margin	TRSKM	|VID|=400mV RxVCM=1.2V RxFCLK=71MHz	500			ps
Clock High Time	TLVCH			$4/(7*RxFCLK)$		ns / ns
Clock Low Time	TLVCL			$3/(7*RxFCLK)$		ns
PLL wake-up-time	TenPLL				150	us
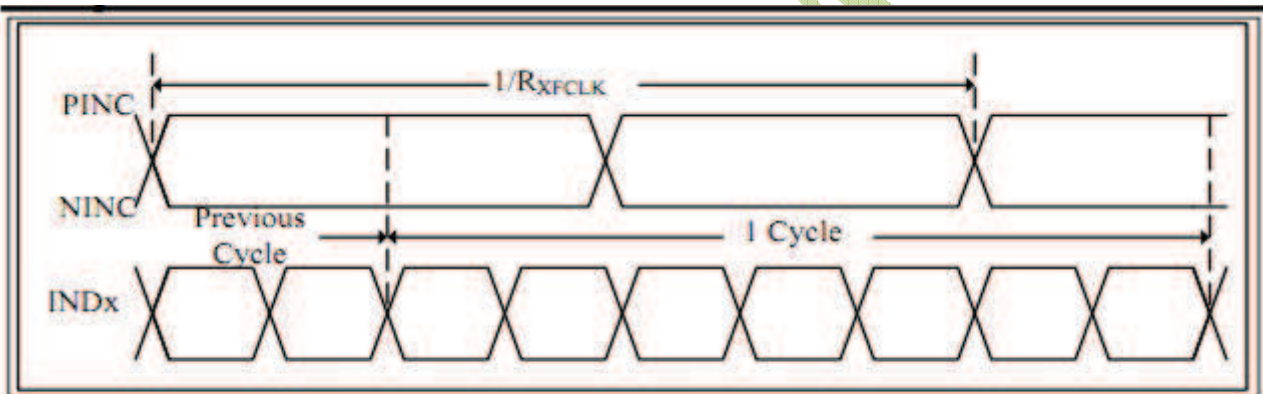
LVDS timing(1)
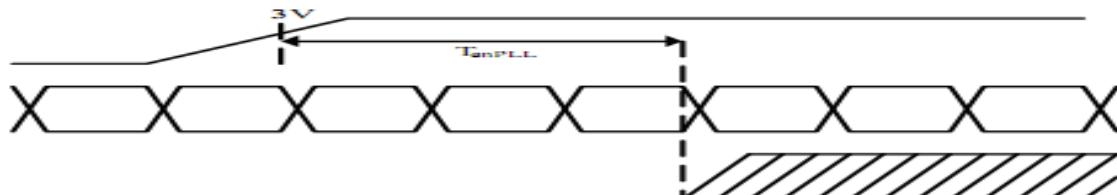
LVDS timing(2)
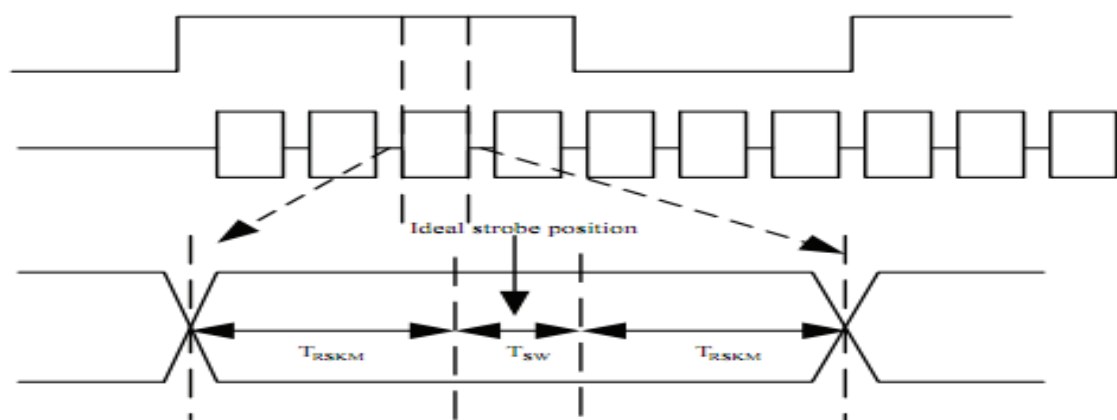
Tsw :Receiver strobe position
TRSKM :Receiver strobe margin

LVDS timing(3)

6.3 Interface signals

Pin No.	Symbol	I/O	Function
1	AGND	P	Analog ground
2	AVDD	P	Analog power
3	VDD	P	Digital power
4	GND	P	Digital ground
5	VCOM	P	Common voltage
6	VDD	P	Digital power
7	GND	P	Digital ground
8	V14	P	Gamma correction voltage reference
9	V13	P	Gamma correction voltage reference
10	V12	P	Gamma correction voltage reference
11	V11	P	Gamma correction voltage reference
12	V10	P	Gamma correction voltage reference
13	V9	P	Gamma correction voltage reference
14	V8	P	Gamma correction voltage reference
15	GND	P	Digital ground
16	VDD_LVDS	P	LVDS powe
17	GND	P	Digital ground
18	PIND3	I	Positive LVDS differential data inputs
19	NIND3	I	Negative LVDS differential data inputs
20	GND	P	Digital ground
21	PINC	I	Positive LVDS differential clock inputs
22	NINC	I	Negative LVDS differential clock inputs
23	GND	P	Digital ground
24	PIND2	I	Positive LVDS differential data inputs
25	NIND2	I	Negative LVDS differential data inputs
26	GND	P	Digital ground
27	PIND1	I	Positive LVDS differential data inputs
28	NIND1	I	Negative LVDS differential data inputs
29	GND	P	Digital ground
30	PIND0	I	Positive LVDS differential data inputs
31	NIND0	I	Negative LVDS differential data inputs
32	GND	P	Digital ground
33	GND_LVDS	P	LVDS ground
34	GRB	I	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=0.1μF)

35	STBYB	I	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	I	Left or right display control
37	VDD	P	Digital power
38	UPDN	I	Up / down display control
39	AGND	P	Analog ground
40	AVDD	P	Analog power
41	VCOM	P	Common voltage
42	DITH	I	Dithering function enable control.Normally pull high. DITHB=1, enable disable internal dithering function. DITHB =0,disable internal dithering function.
43	GND	P	Digital ground
44	VDD	P	Digital Power
45	GND	P	Digital ground
46	V7	I	Gamma correction voltage reference
47	V6	I	Gamma correction voltage reference
48	V5	I	Gamma correction voltage reference
49	V4	I	Gamma correction voltage reference
50	V3	I	Gamma correction voltage reference
51	V2	I	Gamma correction voltage reference
52	V1	I	Gamma correction voltage reference
53	GND	P	Digital ground
54	VDD	P	Digital power
55	GND	P	Digital ground
56	VGH	P	Positive power for TFT
57	VDD	P	Digital power for Gate IC
58	VGL	P	Negative power for TFT
59	GND	P	Digital ground for Gate IC
60	NC	-	Not connect

Note: :

   UPDN and SHLR control function

UPDN	SHLR	FUNCTION
0	1	Normal display
0	0	Inverse Left and Right
1	1	Inverse Up and Down
1	0	Inverse Left and Right Inverse Up and Down

7. *Optical Characteristics*

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		$\theta=0°$ $\Phi=0°$	250	300	380	Cd/m^2	1
Uniformity	⊿Bp			70	80	-	%	1,2
Viewing Angle	3:00		Cr≥10	-	70	-	Deg	3
	6:00			-	50	-		
	9:00			-	70	-		
	12:00			-	70	-		
Contrast Ratio	Cr			400	500	-	-	4
Response Time	T_r+T_f		$\theta=0°$ $\Phi=0°$	-	25	40	ms	5
Color of CIE Coordinate	W	x	$\theta=0°$ $\Phi=0°$	Typ -0.05	0.313	Typ +0.05	-	1,6
		y			0.329		-	
	R	x			0.601		-	
		y			0.339		-	
	G	x			0.341		-	
		y			0.597		-	
	B	x			0.122		-	
		y			0.115		-	
NTSC Ratio	S			45	50	-	%	

Note：The parameter is slightly changed by temperature, driving voltage and materiel

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ5mm)

Measuring condition:

- Measuring surroundings: Dark room.

- Measuring temperature: Ta=25 ℃.

- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.
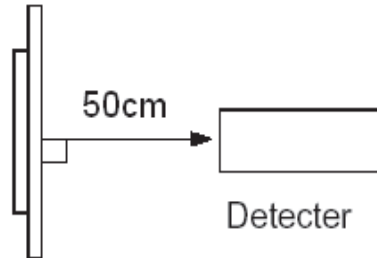
Note 2: The luminance uniformity is calculated by using following formula.

$\angle Bp = Bp\ (Min.)\ /\ Bp\ (Max.) \times 100\ (\%)$

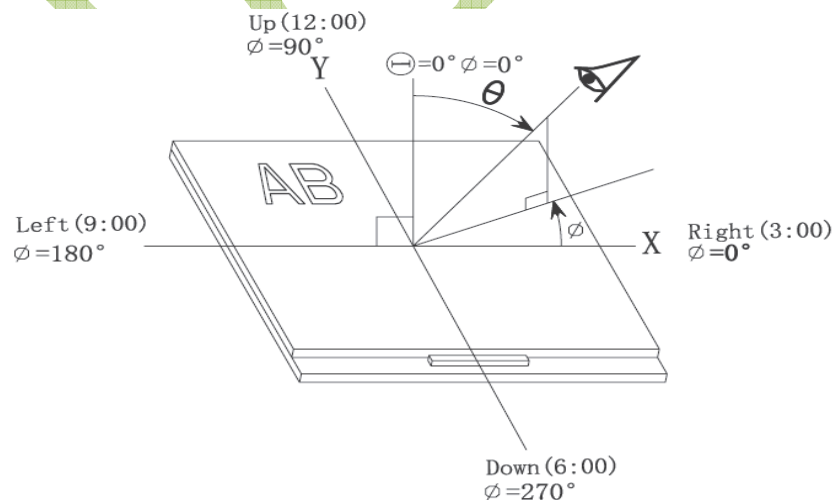*Bp (Max.) = Maximum brightness in 9 measured spots*

Bp (Min.) = Minimum brightness in 9 measured spots.

Active area
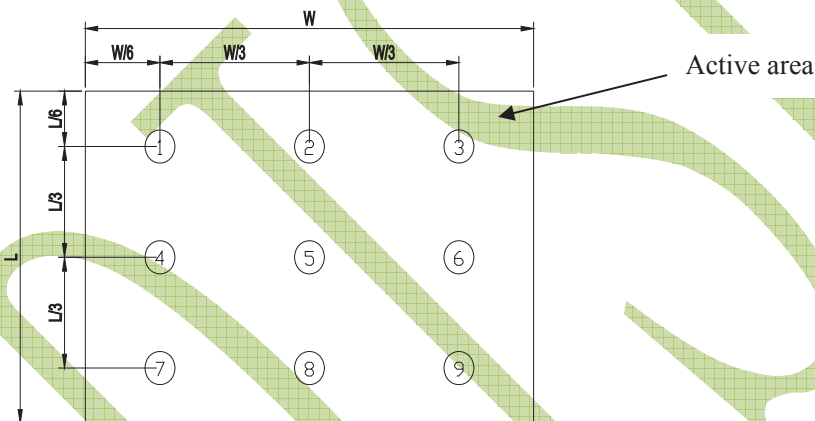
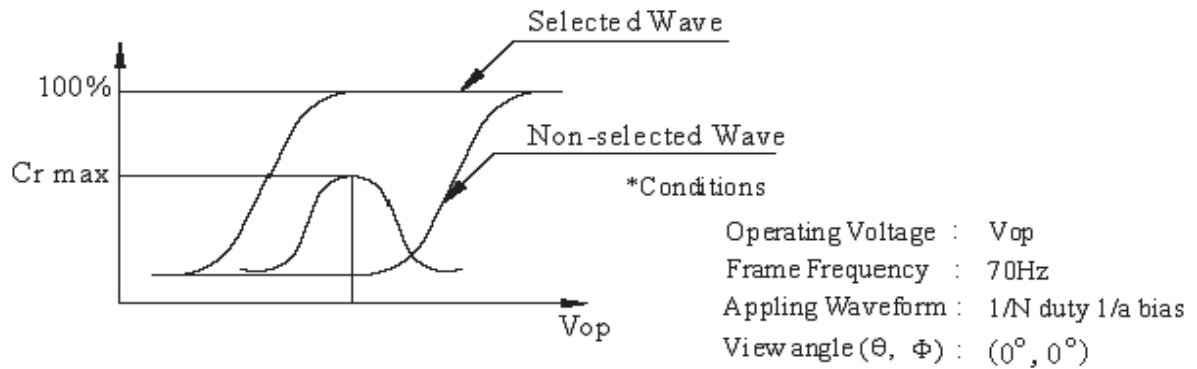*Note 3: The definition of viewing angle:*
*Refer to the graph below marked by ϑ and Φ*

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Note 4: Definition of contrast ratio.(Test LCD using DMS501)

$$Contrast\ ratio(Cr) = \frac{Brightness\ of\ selected\ dots}{Brightness\ of\ non-selected\ dots}$$

Note 5: Definition of Response time. (Test LCD using DMS501):
The output signals of photo detector are measured when the input signals are changed from"white"to"black"(rising time) and from"black"to "white"(falling time) , respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.
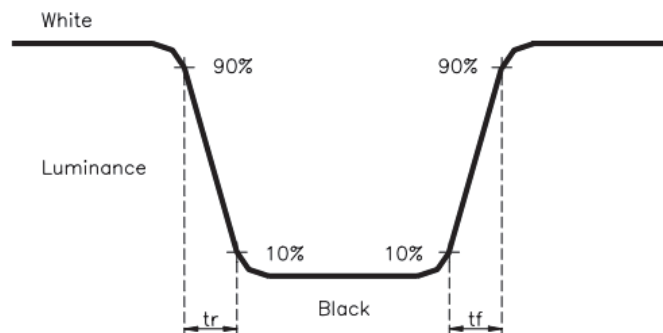
The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

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1931 CIE Chromaticity Diagram
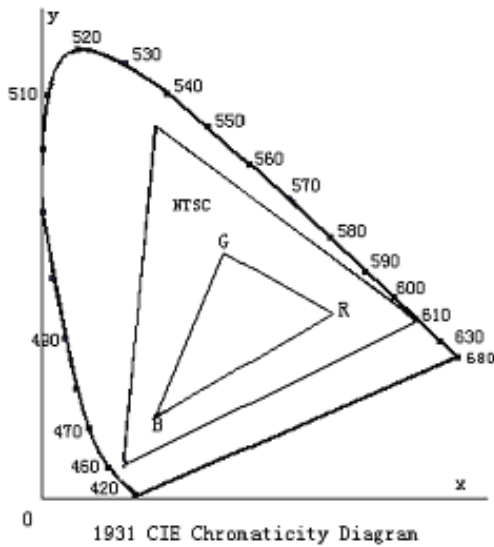
Color gamut:

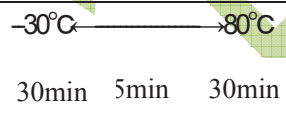$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 7: Definition of cross talk.

*Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100*

Pattern A   Pattern B

Measurement point(center)
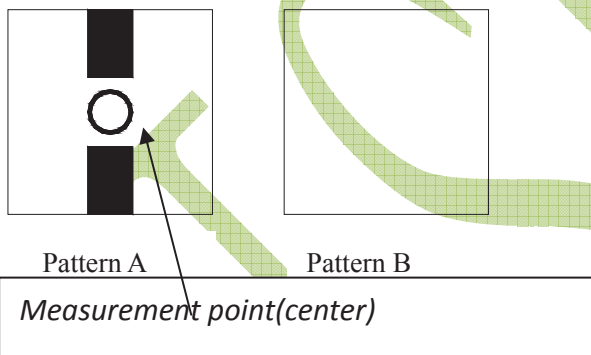
Electric volume value=3F+/-3Hex

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8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃ 96H Restore 2H at 25℃ Power off	
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
3	High Temperature Operation	70℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Restore 4H at 25℃ Power on	
5	High Temperature/Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	-30℃ ←————→ 80℃ 30min 5min 30min after 5 cycle, Restore 2H at 25℃ Power off	

Note: Operation: Supply 3.3V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

　　　　— Isopropyl alcohol　　　— Ethyl alcohol

　　Solvents other than those mentioned above may damage the polarizer.　Especially, do not use the following:

　— Water　　　　　　　　— Ketone　　　　　　　　— Aromatic solvents

9.1.6 Do not attempt to disassemble the LCD Module.

9.1.7 If the logic circuit power is off, do not apply the input signals.

9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

　　a. Be sure to ground the body when handling the LCD Modules.

　　b. Tools required for assembly, such as soldering irons, must be properly ground.

　　c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

　　d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

9.2 Storage precautions

9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature :　　　　0℃ ～ 40℃

Relatively humidity:　≤80%

9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

9.3 *The LCD modules should be no falling and violent shocking during transportation, and also should*

avoid excessive press, water, damp and sunshine.

END