VICTRONIX	Add:	Room 1405A, Building 1B, Hua qiang Idea Park, GuangMing District, Shenzhen, China		
	Tel:	+86-755-33265935	Fax:	+86-755-33265935

SPECIFICATION

VXT700WHA-04

☐ Preliminary Specification

☐ Final Specification

CUSTOMER:

Made By:	**Approved By:**
Checked By:	
Approved By:	**Date:**
Quality:	
Date:	**Note:**
Note:	

2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2021-10-20	V00		The first release	Solon
2022-12-7	V01		Revised Item#6.0	Solon
2022-1-15	V02		Revised Item#4.0 and #6.2	Solon

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3. General Specifications

VXT700WHA-04 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, 7.0'' display area contains 800X(RGB)x480 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	16.7M		1
Viewing Direction	ALL	O'Clock	
Display Mode	Transmissive,Normally Black		
Operating temperature	-30~+85	℃	
Storage temperature	-40~+90	℃	
Module size	Refer to outline drawing	mm	2
Active Area(W×H)	152.42X91.47	mm	
Number of Dots	800×480	dots	
TFT Driver IC	HX5281	-	
Power Supply Voltage	3.3	V	
Backlight	9*3-LEDs (white)	pcs	
Weight	-	g	
Interface	LVDS	-	

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Without FPC and Solder.With

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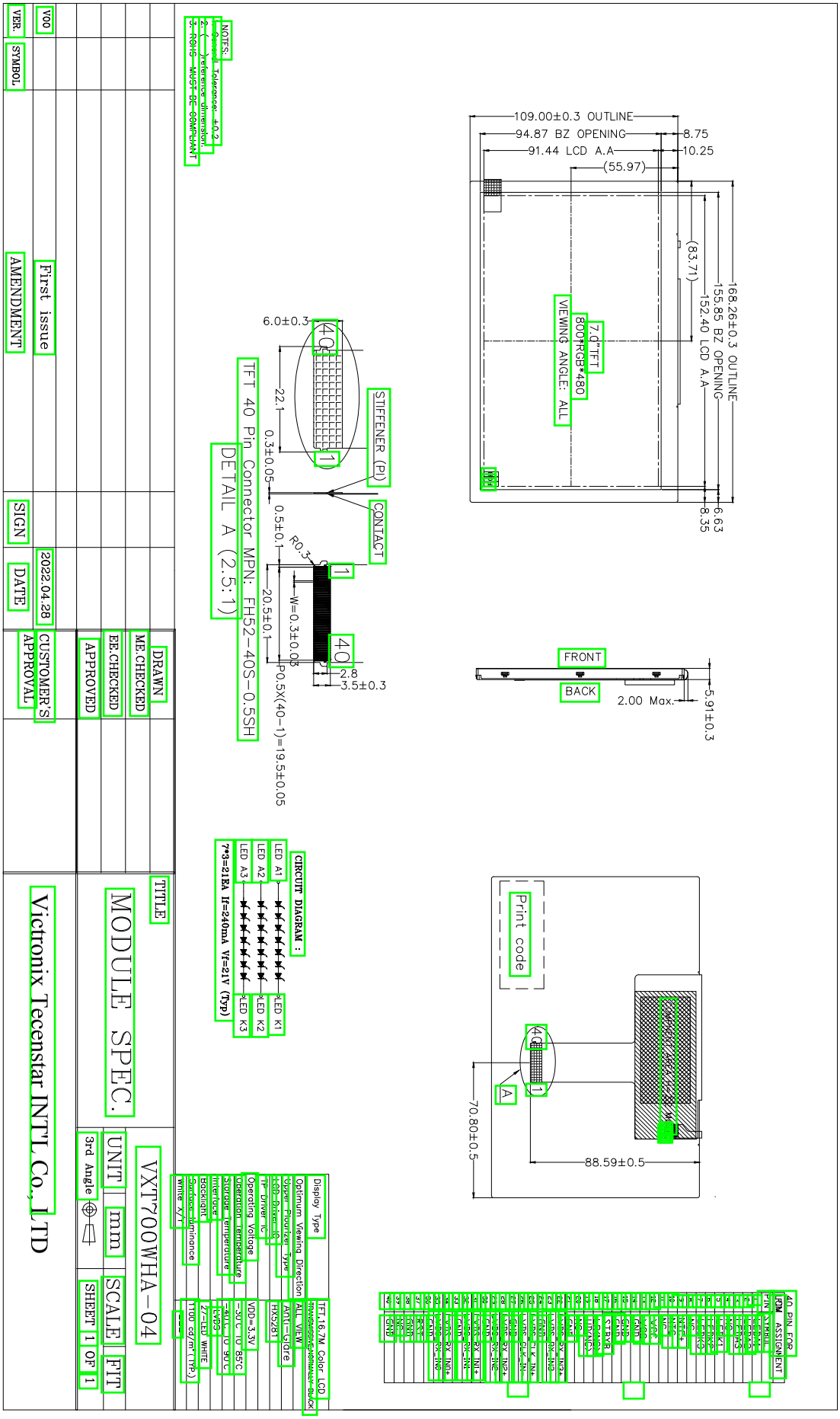
4.Outline.Drawing



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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	VCC	-0.3	+4.0	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. VCC >V_{SS} must be maintained.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-40℃	90℃	-30℃	85℃	1,2
Humidity	-	-	-	-	3

Notes:

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℃.

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6. Electrical Specifications

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

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VCC	Ta=25℃	3.0	3.3	3.6	V	
Input voltage	'H'	V_{IH}	VCC=3.3V	0.7*VCC	-	VCC	V	
	'L'	V_{IL}	VCC=3.3V	-0.3	-	0.3*VCC	V	
Current of power supply		IDD	VCC=3.3V	-	90	-	mA	

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

Item	Symbol	Min	Typ	Max	Unit	Note
Supply voltage	VF	24.3	27	29.7	V	
Supply Current	$\mathbf{I_{VBL}}$	-	180	-	mA	
Power Consumption	$\mathbf{P_{VBL}}$	-	4.86	-	W	(VF=27V)
Uniformity	ΔBp	80	-	-	%	
Life Time	time	-	50K	-	hours	1

Note:

1.The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and ILED = 80mADC(LED forward current) until the brightness becomes ≦ 50% of its original value.

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6.3 Interface signals(LCM)

Pin No.	Symbol	I/O	Function
1-3	LEDA1-LEDA3	P	Power supply for backlight(Anode)
4	NC	-	No connection
5-7	LEDK1-LEDK3	P	Power supply for backlight(Cathode)
8	NC	-	No connection
9	GND	P	Ground.
10	NTC+	I	Negative Temperature Coefficient thermistor pin
11	NTC-	I	Negative Temperature Coefficient thermistor pin
12-13	VCC	P	Power supply
14-16	GND	P	Ground.
17	STBYB	I	Standby mode setting pin. Active high. H: Normal mode. L: Standby mode. Timing controller, output buffer ,DAC and power circuit are off.
18	LR(NC)	-	No connection
19	UD(NC)	-	No connection
20	NC	-	No connection
21	GND	P	Ground.
22	LVDS_RX_IN3+	I	LVDS lane3 input
23	LVDS_RX_IN3-		
24	GND	P	Ground.
25	LVDS_CLK_IN+	I	LVDS lane CLK input
26	LVDS_CLK_IN-		
27	GND	P	Ground.
28	LVDS_RX_IN2+	I	LVDS lane2 input
29	LVDS_RX_IN2-		
30	GND	P	Ground.
31	LVDS_RX_IN1+	I	LVDS lane1 input
32	LVDS_RX_IN1-		
33	GND	P	Ground.
34	LVDS_RX_IN0+	I	LVDS lane0 input
35	LVDS_RX_IN0-		
36	GND	P	Ground.
37	RST	I	Reset signal
38	GND	P	Ground.
39	NC	-	No connection
40	GND	P	Ground.

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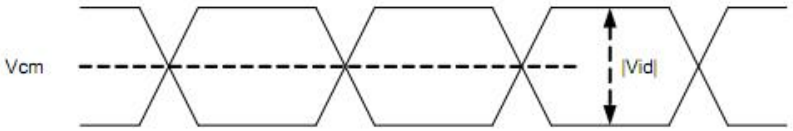
6.4 AC Characteristics

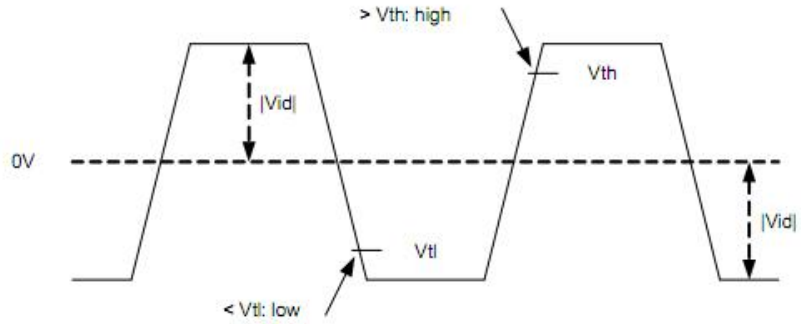
6.4.1 For the digital circuit: LVDS mode

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Differential input high Threshold voltage	Vth	Vcm=1.2V	-	-	+0.1	V
Differential input low threshold voltage	Vtl	-	-0.1	-	-	V
Differential input common Mode 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	|Vid|	-	0.1	-	0.6	V
Differential input leakage Current	Ilvleak	-	-10	-	+10	μA

Single-ended:
LVCLKP(R),
LVCLKN(R),
LVD[3:0]P(R),
LVD[3:0]N(R)



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



6.4.2 For the analog circuit: Normal mode

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Analog positive supply voltage	VSP	VSP is generated by PFM, VSPS [4:0]=14h, with proper settings and components.	6.7	7	7.3	V
Analog negative supply voltage	VSN	VSN is generated by PFM, VSNS [4:0]=14h, with proper settings and components.	-7.3	-7	-6.7	V
Source driver positive supply voltage	VSDP	VSP≧7V,VSDPS[4:0]=14h, loading current=0	6.65	6.8	6.95	V
Source driver negative supply voltage	VSDN	VSN=-7V, VSDNS[4:0]=14h, loading current=0	-6.95	-6.8	-6.65	V
Output for positive gamma reference high voltage	VGMPHO	VSDP≧6.8V, VGMPHS[4:0]=0x1Ah	6.48	6.6	6.72	V
Output for positive gamma reference voltage	VGMPMO	VSDP≧6.8V, VGMPHS[4:0]=0x1Ah VGMPLS[3:0]=0x00h	3.3	3.4	3.5	V

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Output for positive gamma reference low voltage	VGMPLO	VGMPLS[3:0]=0x00h	0.12	0.2	0.28	V
Output for negative gamma reference high voltage	VGMNHO	VSDN≦-6.8V, VGMNHS[4:0]=0x1Ah	-6.72	-6.6	-6.48	V
Output for negative gamma reference voltage	VGMNMO	VSDN≦-6.8V, VGMNHS[4:0]=0x1Ah VGMNLS[4:0]=0x00h	-3.5	-3.4	-3.3	V
Output for negative gamma reference low voltage	VGMNLO	VGMNLS[4:0]=0x00h	-0.28	-0.2	-0.12	V
VCOM voltage	VCOM	VCOMS[7:0]=0x80h	-1.53	-1.48	-1.43	V
Source output voltage, positive polarity	V_{SDOP}	-	0.2	-	VSDP-0.2	V
Source output voltage, negative polarity	V_{SDON}	-	VSDN+0.2	-	-0.2	V
Positive power supply	VGH	VGH is generated by charge pump, VGHS[3:0]=0x05h, loading current=0	14.6	15.6	16.6	V
Negative power supply	VGL	VGL is generated by charge pump, VGLS[2:0]=0x02h, loading current=0	-11	-10	-9	V

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Source output voltage deviation	V_{OD}	V_{SDOP}=0.5V to VSDP-0.5V, V_{SDON}=VSDN+0.5V to -0.5V	-	-	10	mV
		V_{SDOP}=0.2V to 0.5V or V_{SDOP}=VSDP-0.5V to VSDP-0.2V, V_{SDON}=VSDN+0.2V to VSDN+0.5V or V_{SDON}=-0.5V to -0.2V	-	-	15	mV
Standby current **(VCC1 + VCC2)**	I_{STBvcc}	"STBYB=0" and all inputs are default.	-	-	100	μA
Standby current **(VSN or VSP)**	I_{STB}	"STBYB=0", VSP or VSN external input	-	-	100	μA

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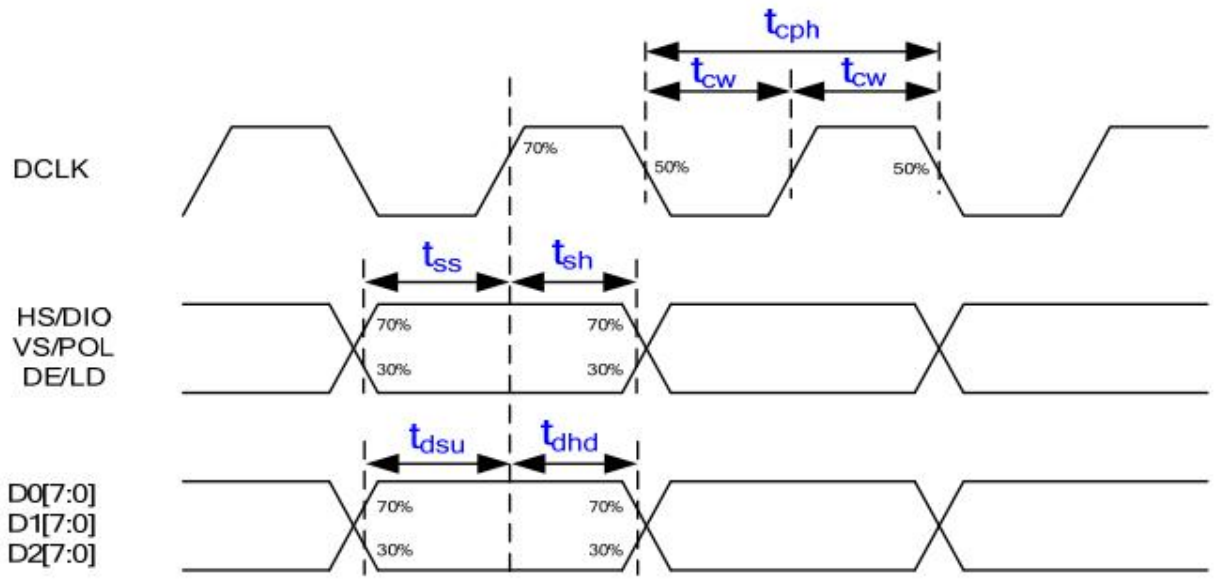
6.4.3 LVDS mode AC electrical characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock frequency	F_{LVCYC}	20	-	85	MHz
Clock period	T_{LVCYC}	11.76	-	-	ns
1 data bit time	UI	-	1/7	-	T_{LVCYC}
Clock high time	T_{LVCH}	2.8	4	4.2	UI
Clock low time	T_{LVCL}	2.8	3	4.2	UI
Position 1	T_{POS1}	-0.2	0	0.2	UI
Position 0	T_{POS0}	0.8	1	1.2	UI
Position 6	T_{POS6}	1.8	2	2.2	UI
Position 5	T_{POS5}	2.8	3	3.2	UI
Position 4	T_{POS4}	3.8	4	4.2	UI
Position 3	T_{POS3}	4.8	5	5.2	UI
Position 2	T_{POS2}	5.8	6	6.2	UI
Input eye width	T_{EYEW}	0.6	-	-	UI
Input eye border	T_{EX}	-	-	0.2	UI
LVDS wake up time	T_{ENLVDS}	-	-	150	us

LVDS with SSC

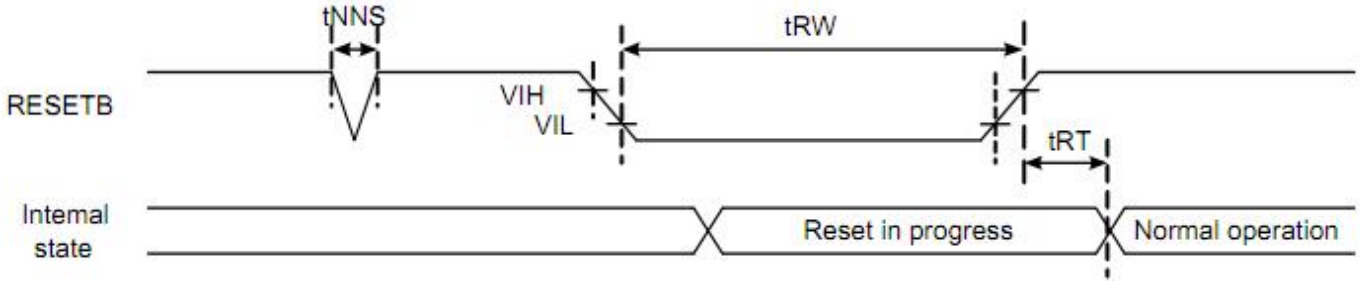
Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max	
Modulation Frequency	SSC_{MF}	LVDS clock frequency center at 80MHz	-	-	200	KHz
		LVDS clock frequency center at 60MHz	-	-	150	KHz
		LVDS clock frequency center at 40MHz	-	-	100	KHz
		LVDS clock frequency center at 20MHz	-	-	50	KHz
Modulation Rate	SSC_{MR}	LVDS clock frequency + SSCMR in the range of 20MHZ~85Mhz	-	-	±5	%

6.4.4 TTL mode AC electrical characteristics



Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK period	T_{cph}	16.67	-	-	ns
DCLK duty ratio	T_{CW}	40	50	60	%
Data setup time	T_{dsu}	5	-	-	ns
Data hold time	T_{dhd}	5	-	-	ns
VS/POL setup time	T_{ss}	5	-	-	ns
VS/POL hold time	T_{sh}	5	-	-	ns
HS/DIO setup time	T_{ss}	5	-	-	ns
HS/DIO hold time	T_{sh}	5	-	-	ns
DE/LD setup time	T_{ss}	5	-	-	ns
DE/LD hold time	T_{sh}	5	-	-	ns

6.5 Reset timing



Signal	Parameter	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
RESETB	Reset pulse width	tRW	10	-	-	μs
	Reset complete time	tRT	-	-	5	μs
	Negative spike noise width	tNNS	-	-	100	ns

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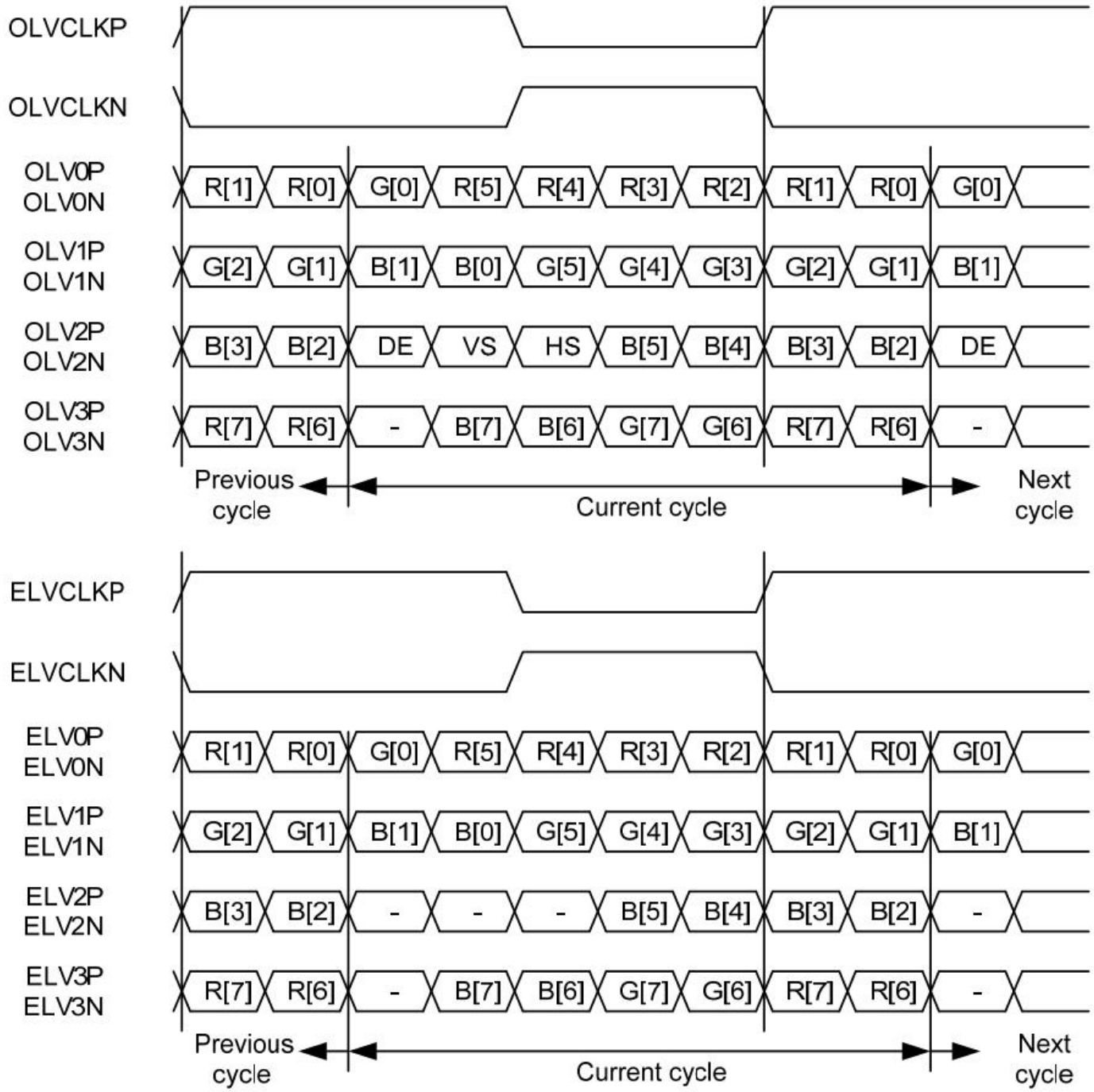
6.6 LVDS interface



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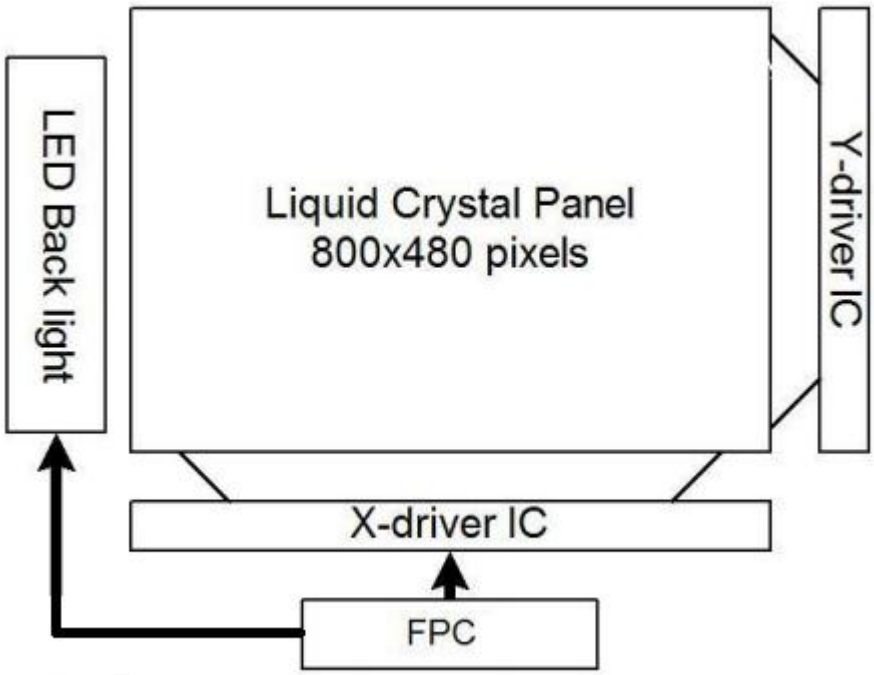
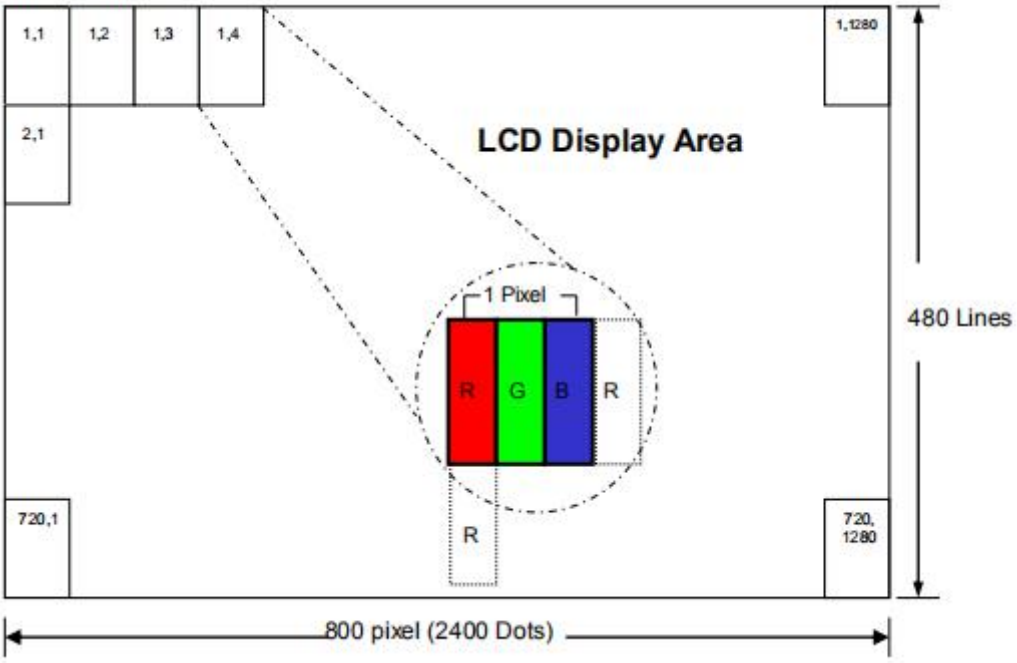
6.6 Block Diagram



Pixel Format



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Relationship Between Displayed Color and Input

	Display	MSB R7	R6	R5	R4	R3	R2	R1	LSB R0	MSB G7	G6	G5	G4	G3	G2	G1	LSB G0	MSB B7	B6	B5	B4	B3	B2	B1	LSB B0	Gray scale Level
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
	↓ Light	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
		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	L	H	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L2
		:								:								:								L3…L251
	↓ Light	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
		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	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:								:								:								L3…L251
	↓ Light	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
		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	H	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L2
		:								:								:								L3…L251
	↓ Light	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
		H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	L253
		H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	L	H	H	H	H	H	H	H	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

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7. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	-	1000	-	Cd/m^2	1
Uniformity	⊿Bp			80	-	-	%	1,2
Viewing Angle	3:00		Cr≥10	75	80	-	Deg	3
	6:00			75	80	-		
	9:00			75	80	-		
	12:00			75	80	-		
Contrast Ratio	Cr		θ=0° Φ=0°	800	1400	-	-	4
Response Time	$T_{r+}T_f$			-	25	35	ms	5
Color of CIE Coordinate	W	x	θ=0° Φ=0°	+0.05	0.315	-0.05	-	1,6
		y			0.325		-	
	R	x			0.641		-	
		y			0.334		-	
	G	x			0.331		-	
		y			0.637		-	
	B	x			0.149		-	
		y			0.046		-	
NTSC Ratio	S			-	71.7	-	%	

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

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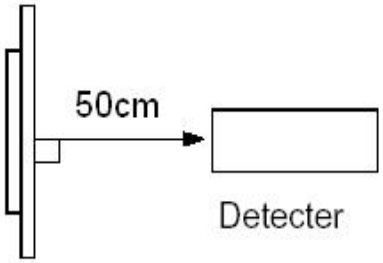
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7



(Φ5mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.

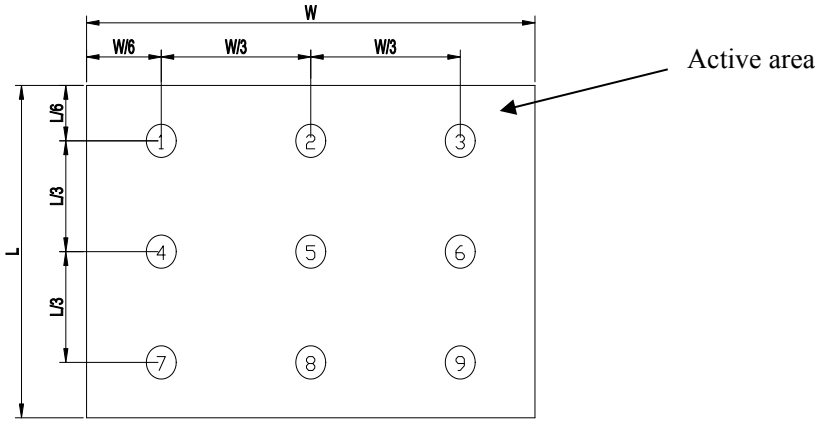
Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)

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

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



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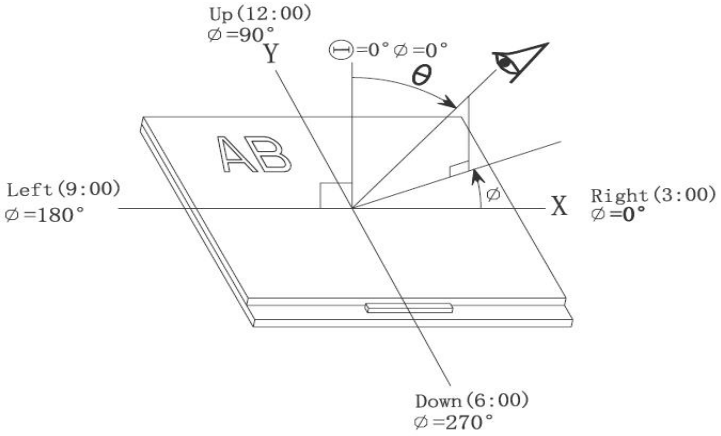
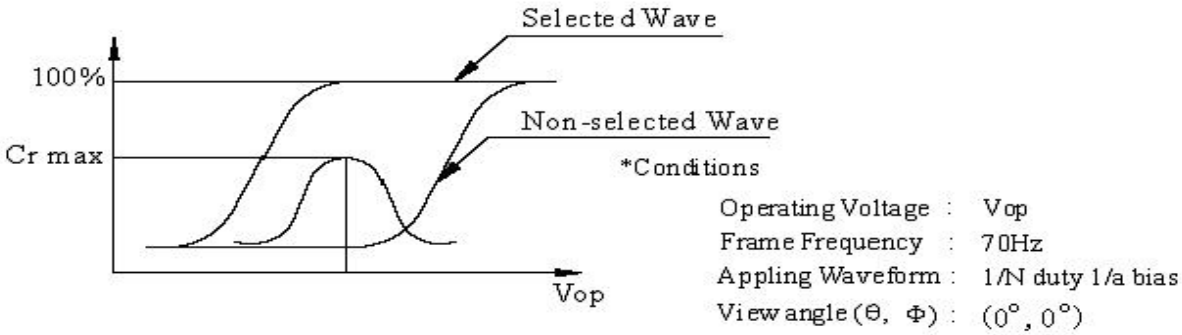
Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ



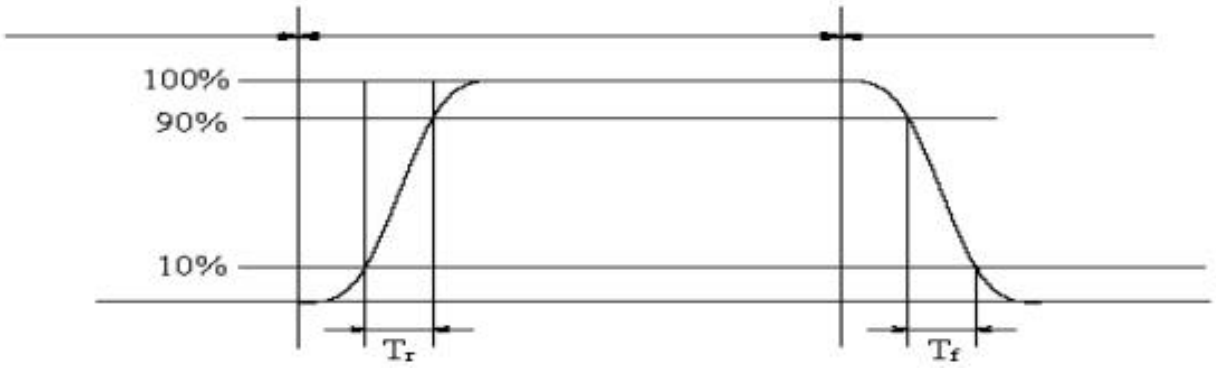
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

Note 5: Definition of Response time. (Test LCD using DMS501):

TThe output signals of photo detector are measured when the input signals are changed from“black”to“white”(falling time) and from“ white”to “black”(rising 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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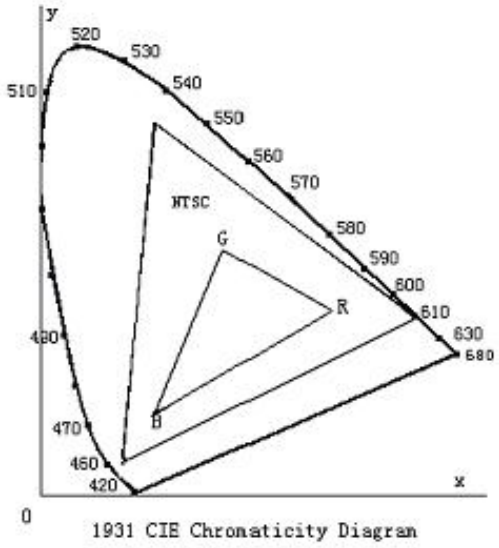
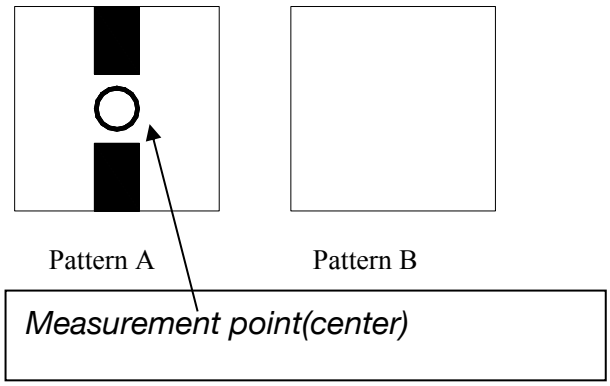


Color gamut:

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

Note 7: Definition of cross talk.
Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100



Electric volume value=3F+/-3Hex

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8. Reliability Test Items and Criteria

Test Item	Test condition	Remark
High Temperature Storage	Ta = 90℃ 144hrs	Note1,Note3, 4
Low Temperature Storage	Ta = -40℃ 144hrs	Note1,Note3, 4
High Temperature Operation	Ta = 85℃ 144hrs	Note2,Note3, 4
Low Temperature Operation	Ta = -30℃ 144hrs	Note1,Note3, 4
Operation at High Temperature/Humidity	+60℃, 90%RH 144hrs	Note3, 4
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 10 cycles, Start with cold temperature and end with high temperature.	Note3, 4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	Contact=+/-8KV, Air=+/-15KV,(R=330R,C=150pF), 1 sec,9point,10times/point;	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time,at least 2 hours at room temperature

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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.

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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

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