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PRODUCT SPECIFICATIONS

For Customer: _____

: APPROVAL FOR SPECIFICATION

Customer Model No. _____

: APPROVAL FOR SAMPLE

Module No.: ZW-T035TQH-01

Date : 2018-09-15

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For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
John	Techshu		Dmjjiang

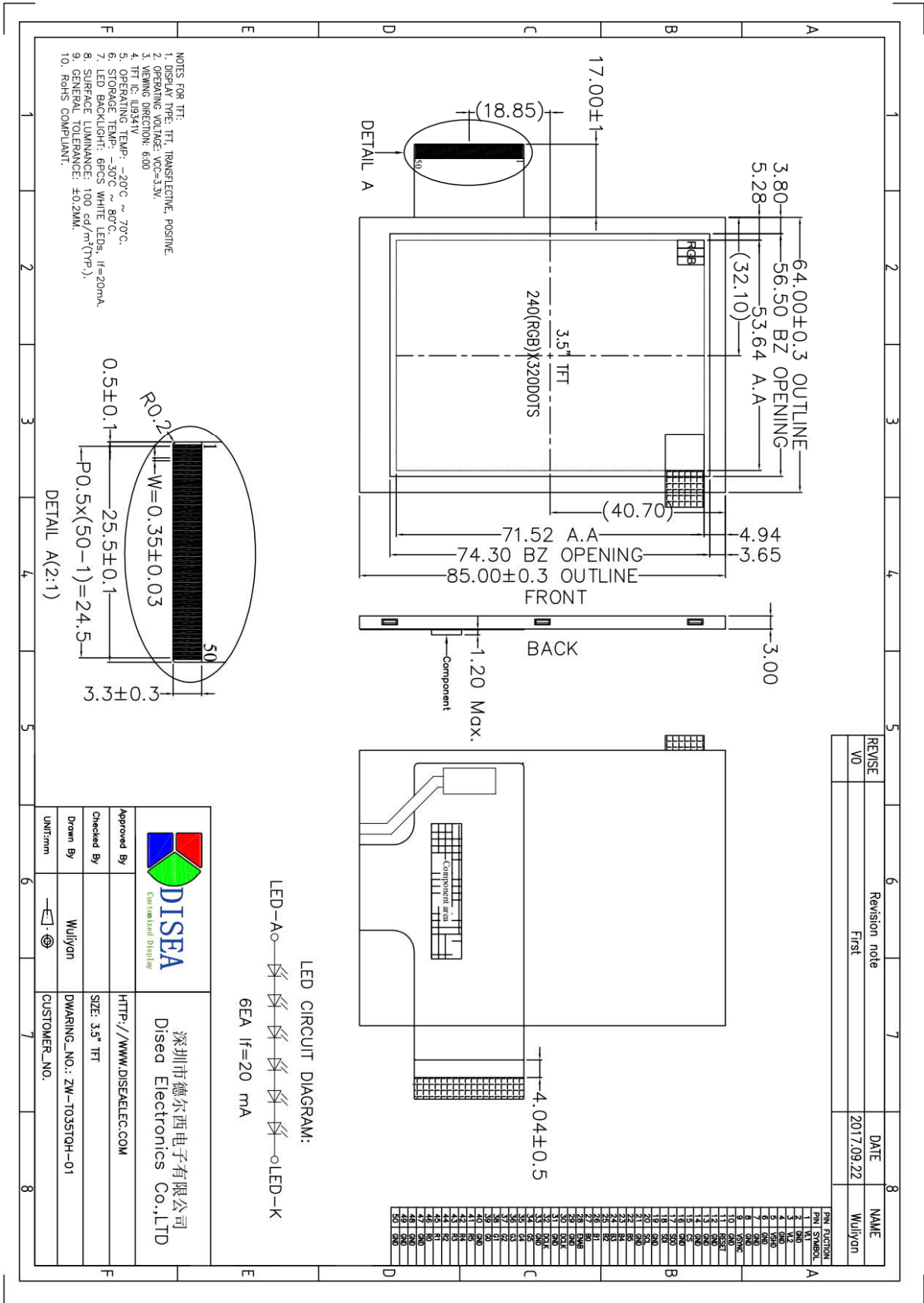
3. General Specifications

ZW-T035TQH-01 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit. The 3.5 '' display area contains 240 x 320pixels and can display up to 262K colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT/Transflective/positive	-	
Display color	262K		1
Viewing Direction	6:00	O'Clock	
Grey scale inversion	12:00	O'Clock	
Pixel Pitch	0.2235x0.2235	mm	
Pixel Configuration	RGB Vertical Stripe		
Operating temperature	-20~+70	°C	
Storage temperature	-30~+80	°C	
Module size	64.0x85.0x3.00	mm	
Active Area(W×H)	53.64X71.52	mm	
Number of Dots	240X320	dots	
Controller	ILI9341V	-	
Power Supply Voltage	2.8	V	
Backlight	6-LEDs (white)	pcs	
Weight	---	g	
Interface	18-Bit+ SPI	-	

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

4.Outline.Drawing



REVISE	Revision note	DATE	NAME
V0	First	2017.09.22	Wuliyun

Approved By		深圳市德尔西电子有限公司 Disea Electronics Co.,LTD
Checked By		HTTP://WWW.DISEALEC.COM
Drawn By	Wuliyun	SIZE: 3.5" TFT
UNIT:mm		DWARING_NO.: ZW-T035TQH-01
		CUSTOMER_NO.

5. Absolute Maximum Ratings($T_a=25^\circ\text{C}$)

5.1 Electrical Absolute Maximum Ratings.($V_{ss}=0\text{V}$, $T_a=25^\circ\text{C}$)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VSHD	-0.3	4.6	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. VSHD >GND 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°C	80°C	-20°C	70°C	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. $T_a \leq 40^\circ\text{C}$: 85%RH MAX.
 $T_a > 40^\circ\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 40°C .

6. Electrical Specifications

6.1 Electrical characteristics ($V_{SS}=0V, T_a=25^\circ C$)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply	V _{SHD}	T _a =25°C	2.5	2.8	3.2	V	
Input voltage	'H'	V _{IH}	V _{SHD} =2.8V	0.8V _{SHD}	-	V _{SHD}	V
	'L'	V _{IL}	V _{SHD} =2.8V	0	-	0.2V _{SHD}	V
Current Consumption	I _{CC1}	Normal mode	-	15	-	mA	1
	I _{CC2}	Sleep mode	-	-	-	mA	1

Note:

1: Tested in 1×1 chessboard pattern.

6.2 LED backlight specification ($V_{SS}=0V, T_a=25^\circ C$)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V _f	I _f =20mA	18.2	19.2	20.0	V	
Uniformity	Δ Bp	I _f =20mA	75	-	-	%	
Life Time	time	I _f =20mA	20000	-	-	hours	1

6.3 Interface signals

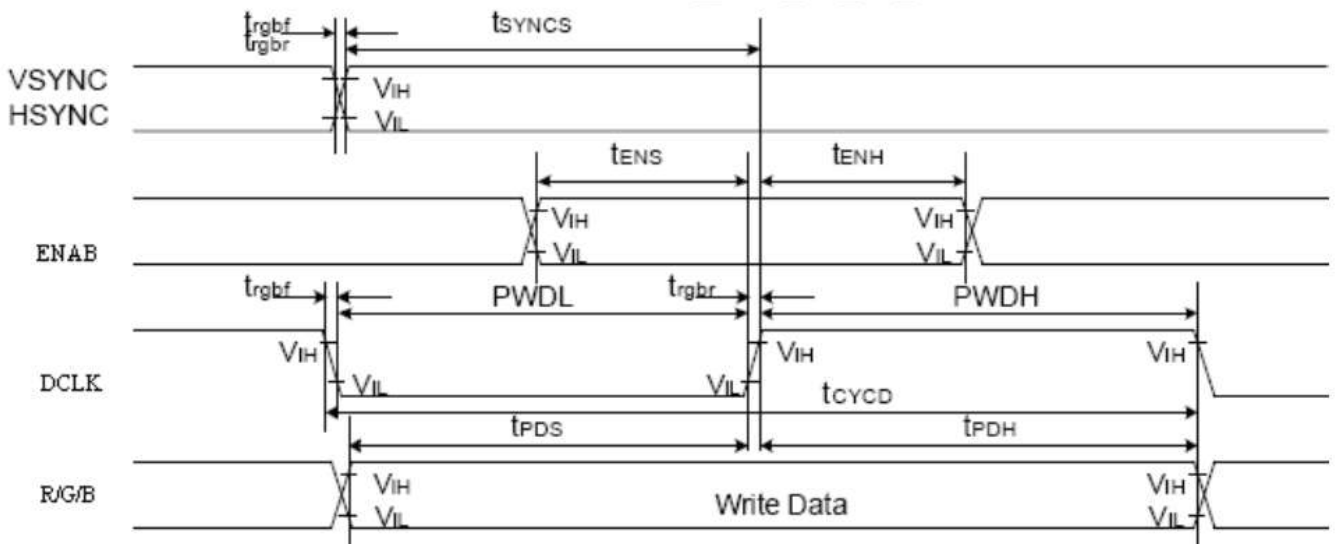
Pin No.	Symbol	I/O	Function
1	VL1	P	Power supply for LED(High voltage)
2	GND	P	Ground
3	VL2	P	Power supply for LED(Low voltage)
4	GND	P	Ground.
5	VSHD	P	Power supply for digital
6-8	GND	P	Ground.
9	VSYNC	I	Vertical sync. in RGB mode
10	GND	P	Ground.
11	RESET	I	Reset(Low active)
12-14	GND	P	Ground.
15	CS	I	Chip select input(Low enable)
16	GND	P	Ground.
17	SDO	O	Serial data output
18	SDI	I	Serial data input
19	GND	P	Ground.
20	SCL	I	Serial interface clock
21	GND	P	Ground.
22-27	B5-B0	I	Blue data input
28	ENAB	I	Data enable in RGB mode
29	GND	P	Ground.
30	HSYNC	I	Horizontal sync. in RGB mode
31	GND	P	Ground.
32	DCLK	I	Pixel clock signal in RGB mode
33	GND	P	Ground.
34-39	G5-G0	I	Green data input
40	GND	P	Ground.
41-46	R5-R0	I	Red data input
47-50	GND	P	Ground.

6.4 Data input timing

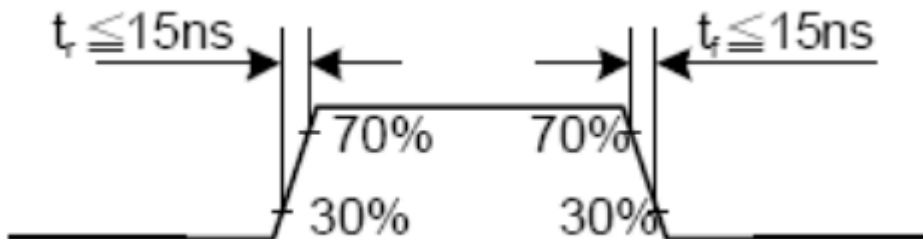
6.4.1 Signal AC Timing

Parameter	Description	Min	Max	Unit	Remark
tSYNCS	VSYNC/HSYNC setup time	15		ns	
tSYNCH	VSYNC/HSYNC hold time	15		ns	
tENS	ENAB setup time	15		ns	
tENH	ENAB hold time	15		ns	
tPOS	Data setup time	15		ns	
tPDH	Data hold time	15		ns	
PWDH	DCLK high-level period	15		ns	
PWDL	DCLK low-level period	15		ns	
tCYCD	DCLK cycle time	100		ns	
trgbr , trgbf	DCLK,HSYNC,VSYNC rise/fall		15	ns	

RGB Interface Characteristics



RGB Interface Timing

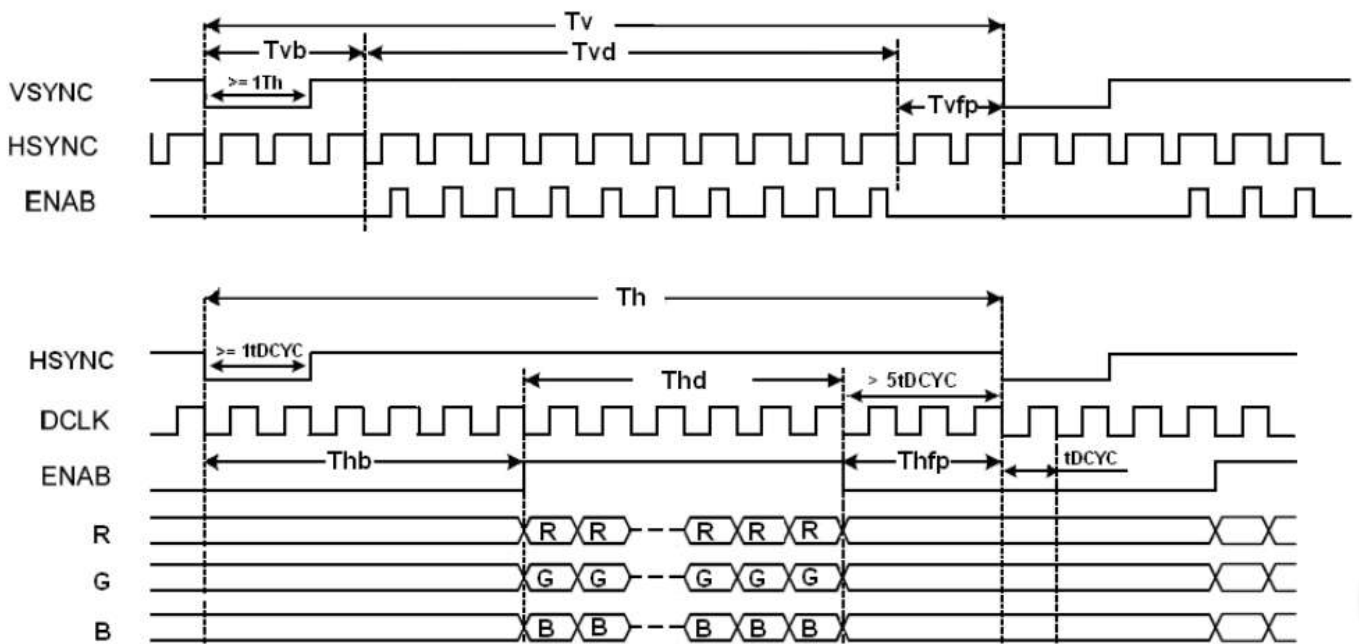


Input signal's rise and fall times

6.4.2 Recommend RGB interface Timing

Parameter	Symbol	Symbol	Min	Typ	Max	Unit	Remark
DCLK	DCLK frequency	fDCYC	-	5.64	10	MHz	
	DCLK period	tDCYC	100	177.15	-	ns	
HSYNC	Horizontal	Thd	240			DCLK	
	1horizontalline	Th	-	310	-		
	Horizontal blank	Thb	56	60	-		
	Horizontal front porch	Thfp	2	10	16		
VSYNC	Vertical display area	Tvd	320			Line	
	Vsync period time	Tv	-	328	-		
	Vsync blank	Tvb	2	4	-		
	Vsync Front porch	Tvfp	2	4	-		

Recommend Input Timing(DCLK,HSYNC,VSYNC,ENAB)



Recommend RGB Interface Timing

7. Optical Characteristics

7.1 Optical specification (Backlight on IF=20mA)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp	$\theta=0^\circ$	75	100	-	Cd/m ²	1
Uniformity	\sphericalangle Bp	$\Phi=0^\circ$	75	-	-	%	1,2
Viewing Angle	3:00	Cr \geq 10	40	50	-	Deg	3
	6:00		35	45	-		
	9:00		45	45	-		
	12:00		50	60	-		
Contrast Ratio	Cr	$\theta=0^\circ$	100	150	-	-	4
Response Time	T _r +T _f	$\Phi=0^\circ$	-	35	-	ms	5
			-		-		
Color of CIE Coordinate	W	x	0.2957	0.3357	0.3757	-	1,6
		y	0.2676	0.3076	0.3476	-	
	R	x	0.6377	0.6877	0.7377	-	
		y	0.1549	0.2049	0.2549	-	
	G	x	0.3511	0.4011	0.4511	-	
		y	0.3611	0.4110	0.4611	-	
	B	x	0.2119	0.2619	0.3119	-	
		y	0.0715	0.1215	0.1715	-	
Surface reflection (SCI)	-	$\theta=0^\circ$ $\Phi=0^\circ$	-	60	-	%	

7.2 Optical specification (Backlight off)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	3:00	Cr≥10	50	60	-	Deg	3
	6:00		50	60	-		
	9:00		45	55	-		
	12:00		50	60	-		
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$	-	6.5	-	-	4
Response Time	T_r+T_f		-	35	-	ms	5
Color of CIE Coordinate	W	x	0.2757	0.3157	0.3557	-	1,6
		y	0.2876	0.3276	0.3676	-	
Reflectance	-	$\theta=0^\circ$ $\Phi=0^\circ$	-	7.0	-	%	

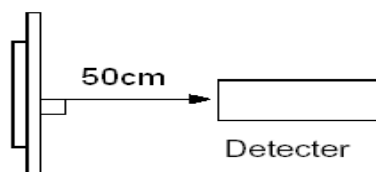
Note: The parameter is slightly changed by temperature, driving voltage and materiel

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 PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: $T_a=25^\circ\text{C}$.
- 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.

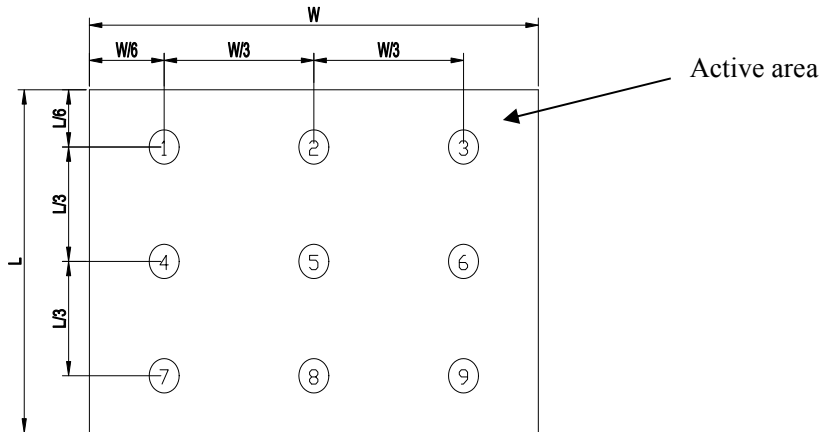


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta B_p = B_p (\text{Min.}) / B_p (\text{Max.}) \times 100 (\%)$$

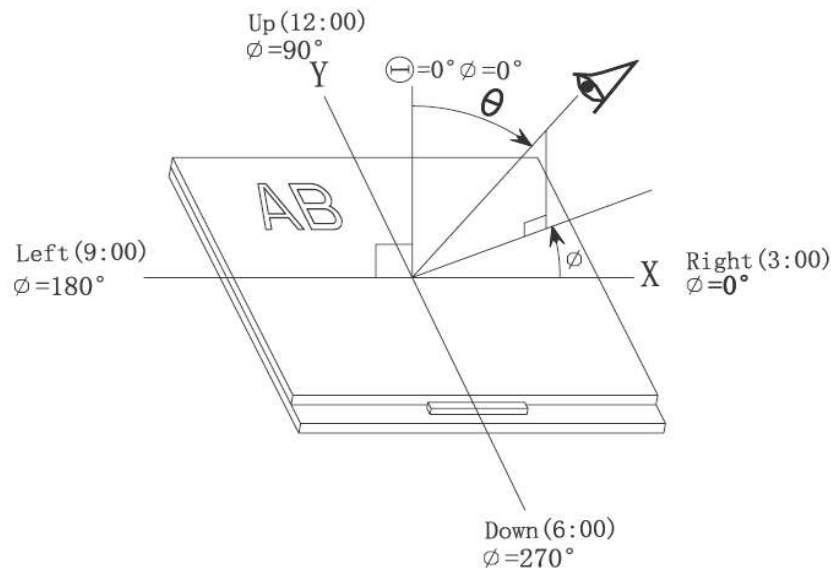
$B_p (\text{Max.})$ = Maximum brightness in 9 measured spots

$B_p (\text{Min.})$ = Minimum brightness in 9 measured spots.

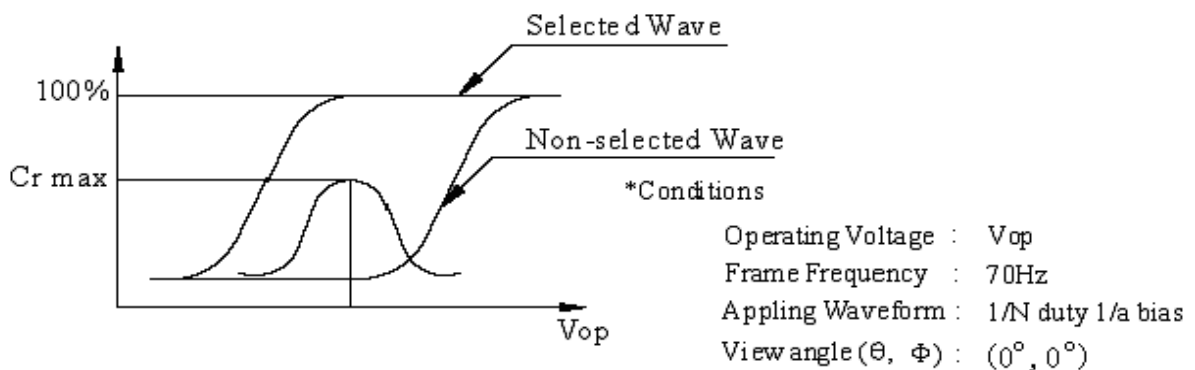


Note 3: The definition of viewing angle:

Refer to the graph below marked by ϑ and Φ



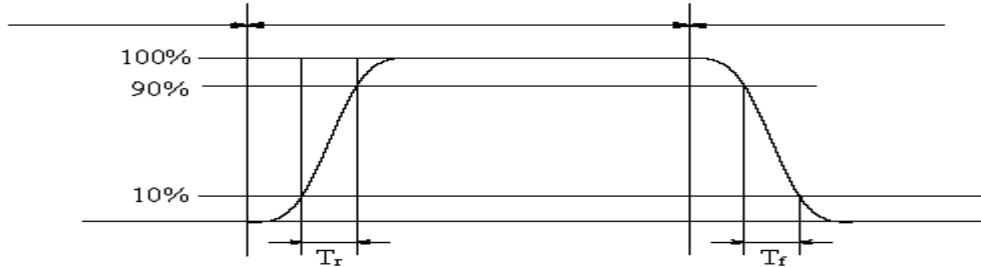
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

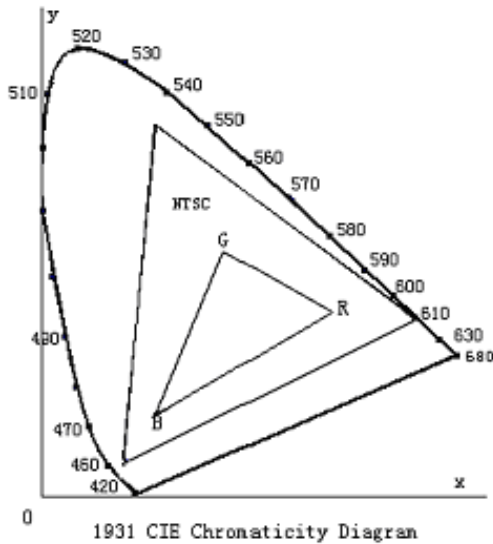
Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from "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.

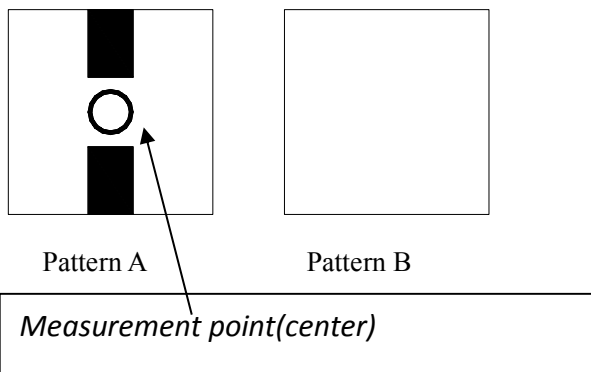


Color gamut:

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

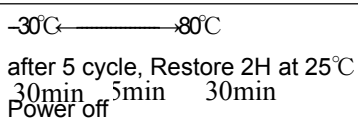
Note 7: Definition of cross talk.

$$\text{Cross talk ratio(\%)} = \frac{|\text{pattern A Brightness} - \text{pattern B Brightness}|}{\text{pattern A Brightness}} \times 100$$



Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C 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.
2	Low Temperature Storage	-30°C±2°C 96H Restore 2H at 25°C Power off	
3	High Temperature Operation	70°C±2°C 96H Restore 2H at 25°C Power on	
4	Low Temperature Operation	-20°C±2°C 96H Restore 4H at 25°C Power on	
5	High Temperature/Humidity Storage	60°C±2°C 90%RH 96H Power off	
6	Temperature Cycle	 after 5 cycle, Restore 2H at 25°C 30min 5min 30min Power off	
7	Vibration Test	10Hz~150Hz, 100m/s ² , 120min	Not allowed cosmetic and electrical defects.
8	Shock Test	Half- sine wave,300m/s ² ,11ms	

Note: Operation: Supply 2.8V 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 °C ~ 40 °C

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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