



# Disea Electronics Co., LTD

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## PRODUCT SPECIFICATIONS

For Customer: \_\_\_\_\_

: APPROVAL FOR SPECIFICATION

Customer Model No. \_\_\_\_\_

: APPROVAL FOR SAMPLE

Module No.: ZW-T156BFH-01CP

Date : 2023.9.22

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### For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	APPROVER
YZJ		



## 3. General Specifications

ZW-T156BFH-01CP is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit and CTP. The 15.6" display area contains 1920x1080 pixels and can display up to 262K colors. This product accords with RoHS environmental criterion.

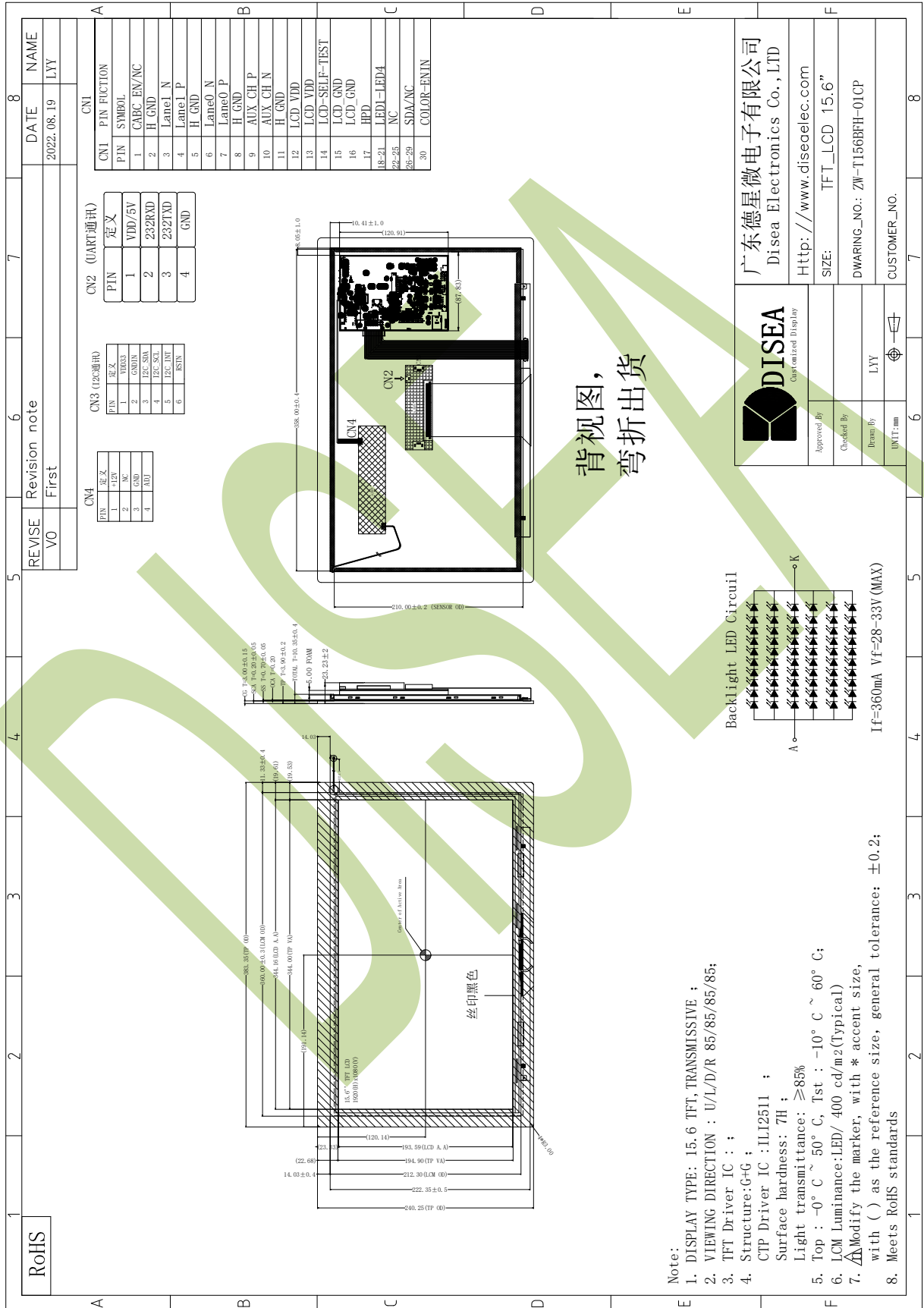
### 3.1 LCD Parameter

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	262K		
Viewing Direction	ALL	O'Clock	
Operating temperature	0~+50	°C	
Storage temperature	-10~+60	°C	
Module size	Refer to outline drawing	mm	
Active Area(W×H)	344.16x193.59	mm	
Number of Dots	1920x1080	dots	
Driver IC	-	-	
Power Supply Voltage	3.3	V	
Outline Dimensions	Refer to outline drawing	-	
Backlight	10S6P-LEDs (white)	pcs	
Interface	DP	-	

## 3.2 CTP Parameter

Item	Contents	Unit	Note
Outline Size	383.35(H)X240.25(V)X3.90(T)	mm	
Cover View Area	344.00(H)X194.90(V)		
CTP Resolution	16348x16348	dots	
Interface Mode	IIC/USB	-	
Touch Mode	10 Human fingers multi-touch	-	
Surface hardness	$\geq 7H$	-	
Transparency	$\geq 85\%$	-	
Accuracy	Centre $\pm 2.5$ , Edge $\pm 3.5$ mm	mm	
CTP Controller	ILI2511	-	
Power Supply Voltage	3.3/5	V	

## 4.Outline.Drawing



## 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	$V_{DD}$	-0.3	4.0	V	1, 2
CTP Power Supply Voltage	VDD(IIC)	2.8	3.3	V	1, 2
CTP Power Supply Voltage	VDD(USB)	4.7	5.2	V	1, 2

Notes:

- 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.
- $V_{DD} > V_{SS}$  must be maintained.
- Please be sure users are grounded when handing LCD Module.

### 5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating	
	MIN.	MAX.	MIN.	MAX.
Ambient Temperature	0°C	50°C	-10°C	60°C
Humidity	-	-	-	-

- The response time will become lower when operated at low temperature.
- Background color changes slightly depending on ambient temperature.

*The phenomenon is reversible.*

- $T_a \leq 40^\circ\text{C}$ : 85%RH MAX.

$T_a \geq 40^\circ\text{C}$ : Absolute humidity must be lower than the humidity of 85%RH at  $40^\circ\text{C}$ .

## 6. Electrical Specifications and Instruction Code

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note	
Power supply	VDD	$T_a=25^\circ C$	3.0	3.3	3.6	V		
Input voltage	'H'	$V_{IH}$	$V_{DD}=3.3V$	$0.7V_{DD}$	-	$V_{DD}$	V	
	'L'	$V_{IL}$	$V_{DD}=3.3V$	0	-	$0.3V_{DD}$	V	

*Note: If one of the above items is exceeded its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range.*

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

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage VLED	$V_f$	$I_f=360mA$	28	30	33	V	
Uniformity	$\Delta B_p$	$I_f=360mA$	75	-	-	%	
LED Life Time	-	-	20000	-	-	hr	1

*Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature  $T_a=25^\circ C$*

## 6.3 Interface signals

### 6.3.1 LCM PIN

Pin No.	Symbol	I/O	Function	Remark
1	CABC_ENABLE	-	CABC_Function Reserved	
2	H_GND	P	High Speed round	
3	Lane1_N	I	Complement Signal Link Lane 1	
4	Lane1_P	I	True Signal Link Lane 1	
5	H_GND	P	High Speed round	
6	Lane0_N	I	Complement Signal Link Lane 0	
7	Lane0_P	I	True Signal Link Lane 0	
8	H_GND	P	High Speed round	
9	AUX_CH_P	I	True Signal Auxiliary Channel	
10	AUX_CH_N	I	Complement Signal Auxiliary Channel	
11	H_GND	P	High Speed round	
12	LCD_VDD	P	LCD logic and driver power(3.3V)	
13	LCD_VDD	P	LCD logic and driver power(3.3V)	
14	LCD_Self_Test	I	Reserved for LCD manufacturer's use	
15	LCD_GND	P	LCD logic and driver ground	
16	LCD_GND	P	LCD logic and driver ground	
17	HPD	O	HPD signal pin	
18	LED-1	P	Backlight K	
19	LED-2	P	Backlight K	
20	LED-3	P	Backlight K	
21	LED-4	P	Backlight K	
22	NC	I	NC	
23	NC	I	NC	
24	NC	-	NC	
25	NC	-	NC	
26	BL_PWR	P	Backlight power	
27	BL_PWR	P	Backlight power	
28	BL_PWR	P	Backlight power	
29	BL_PWR	P	Backlight power	
30	COLOR_ENIN	-	Color Engin Function Reserved	

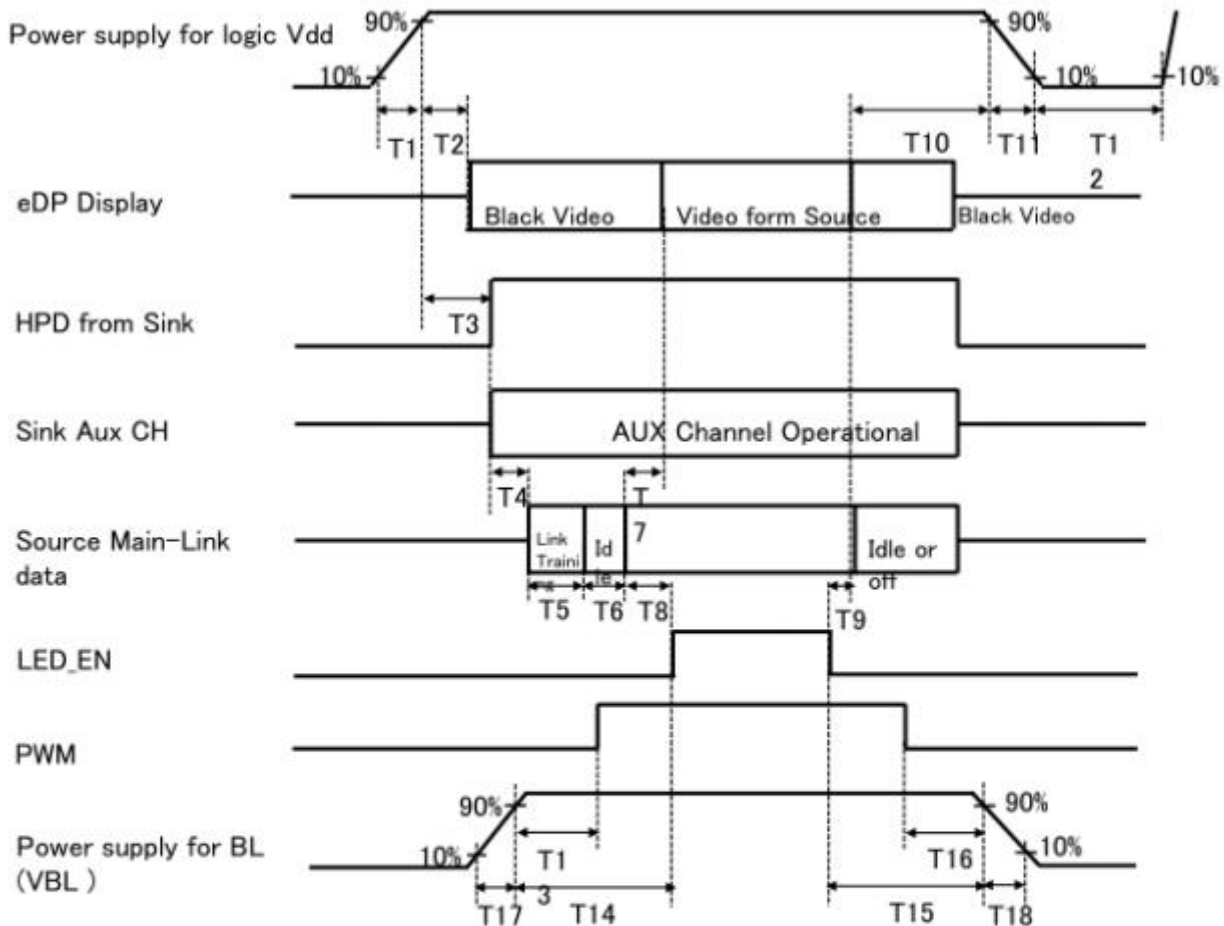


## CTP interface

Pin No.	Symbol	I/O	Function
1	VDD	P	Power supply
2	GNDIN	P	Ground
3	I2C_SDA	I/O	Serial input/output data bus
4	I2C_SCL	O	Serial interface clock pin
5	I2C_INT	O	External Interrupt pin
6	RSTN	I	Reset signal

## 6.4 Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



- 0.5ms ≤ T1 ≤ 10 ms
- 0ms ≤ T2 ≤ 200 ms
- 0ms ≤ T3 ≤ 200 ms
- 0ms ≤ T13
- 0ms ≤ T14
- 0ms ≤ T17
- 0ms ≤ T7 ≤ 50ms
- 0ms ≤ T10 ≤ 500 ms
- 0 ms ≤ T11 ≤ 10 ms
- 150ms ≤ T12
- 0ms ≤ T15
- 0ms ≤ T16
- 0ms ≤ T18

**Notes:**

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

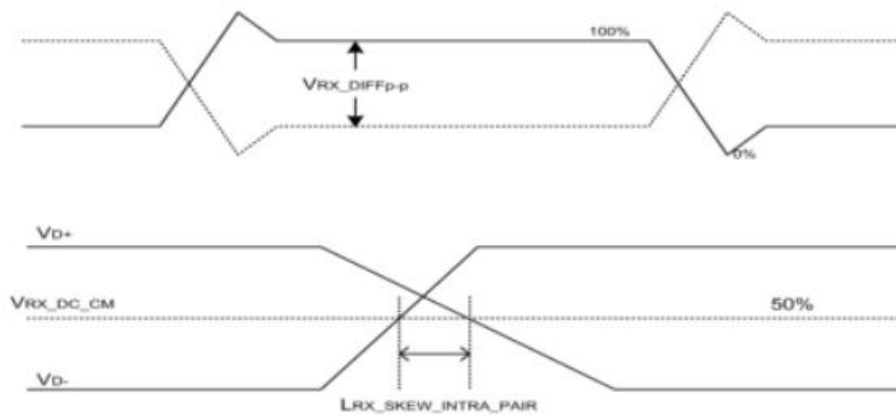
## 6.5 Timing Characteristics

### 6.5.1 Input signals

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	100	141.4	146	MHz
	High Time	Tch	-	-	-	Tc
	Low Time	Tcl	-	-	-	Tc
Frame Period		Tv	1090	1100	1238	lines
			-	60	-	Hz
			-	16.7	-	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	2096	2142	2400	clocks
Horizontal Display Period		Thd	-	1920	-	clocks

## 6.6 DC Characteristics

Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock	ssc			0.5	%	
Differential peak-to-peak input voltage at package pins	VRX-DIFFp-p	$\pm 60$	0	$\pm 600$	mV	Pins are AC-coupled
Rx input DC common mode voltage	VRX_DC_CM	0	-	2.0	V	
Differential termination resistance	RRX-DIFF	90	100	110	$\Omega$	
Single-ended termination resistance	RRX-SE	45	50	55	$\Omega$	
Rx short circuit current limit	IRX_SHORT	-	-	20	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	LRX_SKEW_INTRA_PAIR	-	-	60	ps	



## 7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Brightness	Bp	$\theta=0^\circ$	-	400	-	cd/m <sup>2</sup>	1	
Uniformity	$\Delta Bp$	$\Phi=0^\circ$	75	-	-	%	1,2	
Viewing Angle	3:00	Cr $\geq$ 10	-	85	-	Deg	3	
	6:00		-	85	-			
	9:00		-	85	-			
	12:00		-	85	-			
Contrast Ratio	Cr	$\theta=0^\circ$	-	800	-	-	4	
Response Time	T <sub>r</sub> +T <sub>f</sub>	$\Phi=0^\circ$	-	30	35	ms	5	
Color of CIE Coordinate	W	x	$\theta=0^\circ$ $\Phi=0^\circ$	Typ-0 .05	TBD	Typ+0. 05	-	1,6
		y					-	
	R	x					-	
		y					-	
	G	x					-	
		y					-	
	B	x					-	
		y					-	
NTSC Ratio	S		72	-	-	%		

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

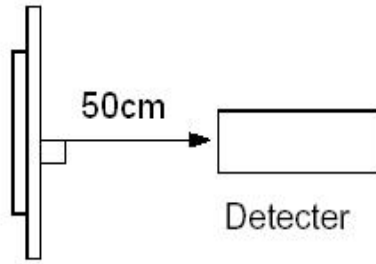
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ5mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25 °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.

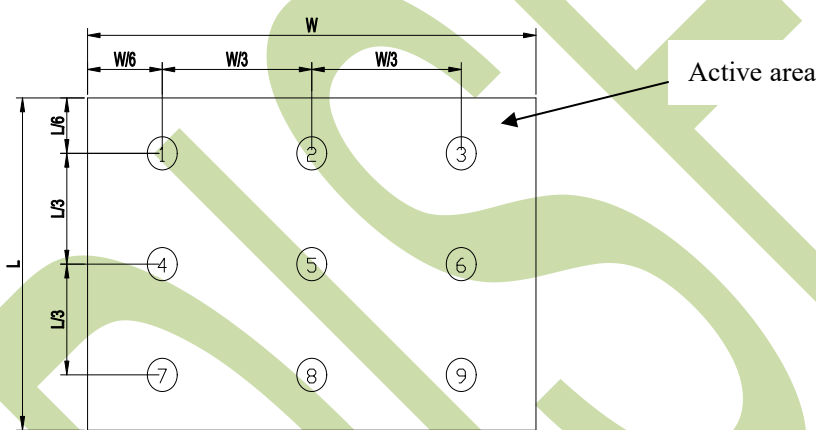


Note 2: The luminance uniformity is calculated by using following formula.

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

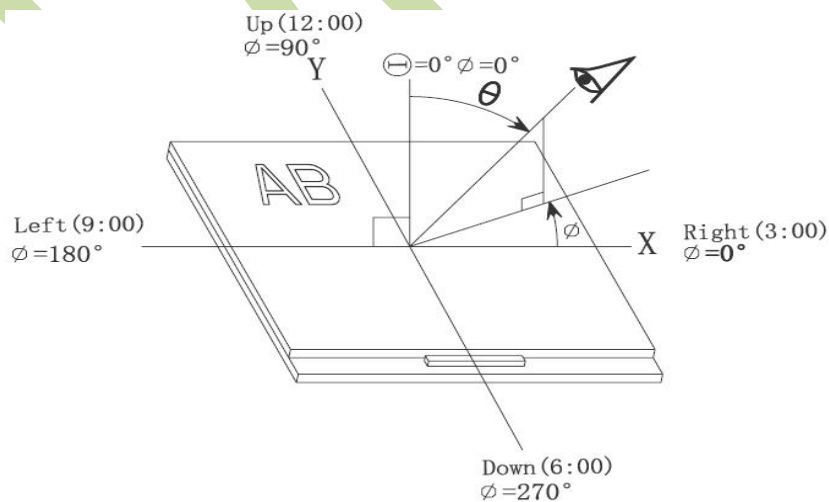
$Bp (\text{Max.})$  = Maximum brightness in 9 measured spots

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

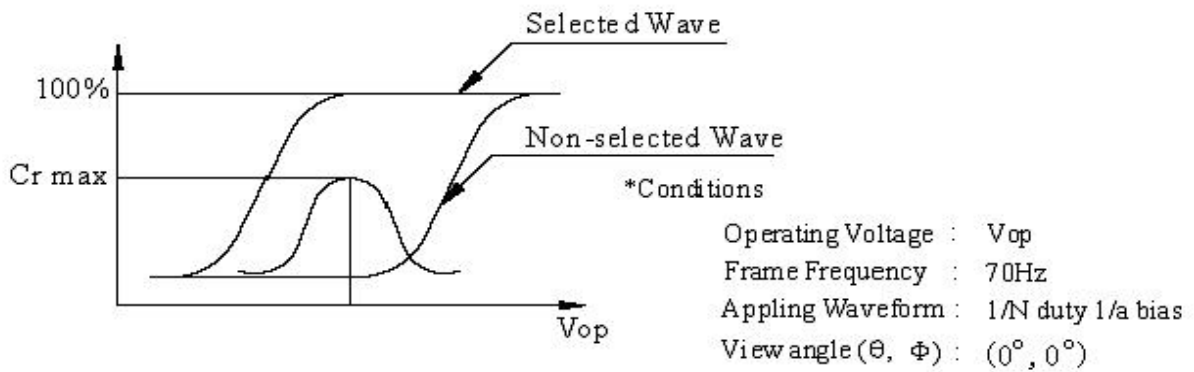


Note 3: The definition of viewing angle:

Refer to the graph below marked by  $\vartheta$  and  $\phi$



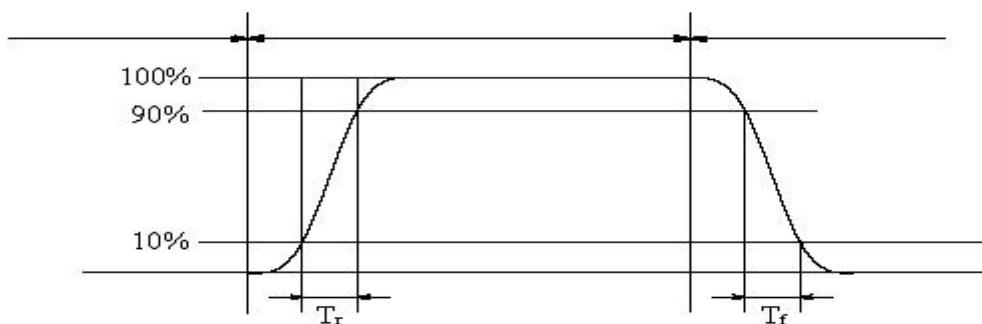
Note 4: Definition of contrast ratio.( Test LCD using DMS501)



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

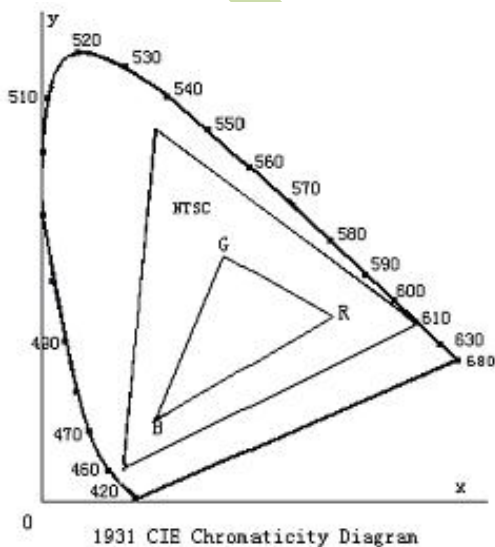
Note 5: Definition of Response time. (Test LCD using DMS501):

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.

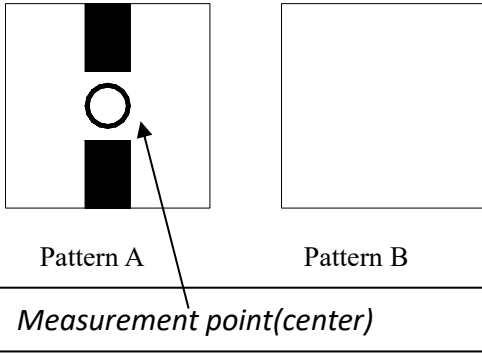


Color gamut:

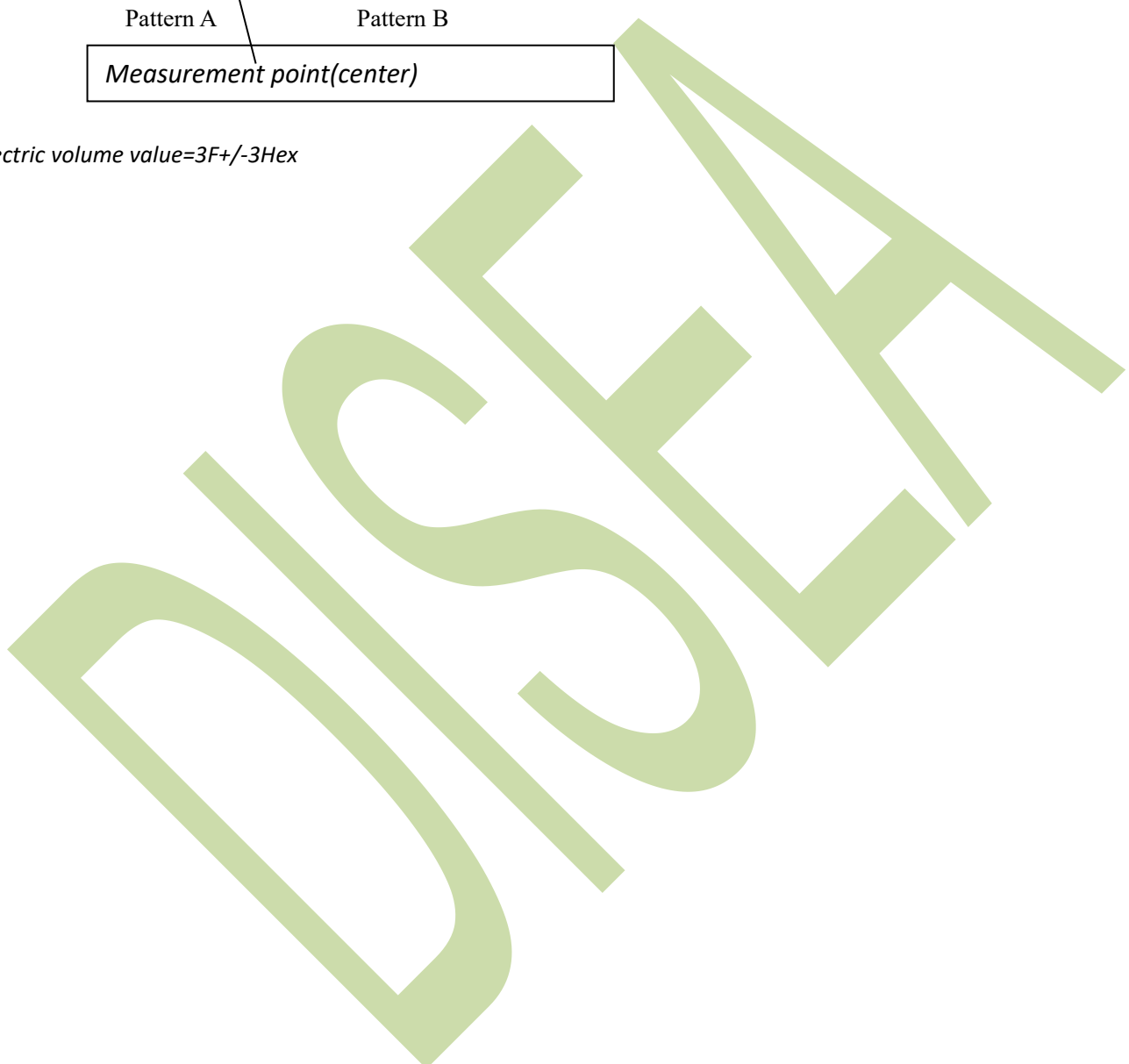
$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 7: Definition of cross talk.

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



Electric volume value=3F+/-3Hex





## 8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	60°C±2°C 72H 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	-10°C±2°C 72H Restore 2H at 25°C Power off	
3	High Temperature Operation	50°C±2°C 72H Restore 2H at 25°C Power on	
4	Low Temperature Operation	0°C±2°C 72H Restore 4H at 25°C Power on	
5	High Temperature/Humidity Operation	40°C±2°C 90%RH 72H Power on	

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 °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