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PRODUCT SPECIFICATIONS

For Customer: _____

: APPROVAL FOR SPECIFICATION

Customer Model No. _____

: APPROVAL FOR SAMPLE

Module No.: ZW-T101BAH-09CP

Date : 2019-12-06

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For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
SSX	YGM		

3. General Specifications

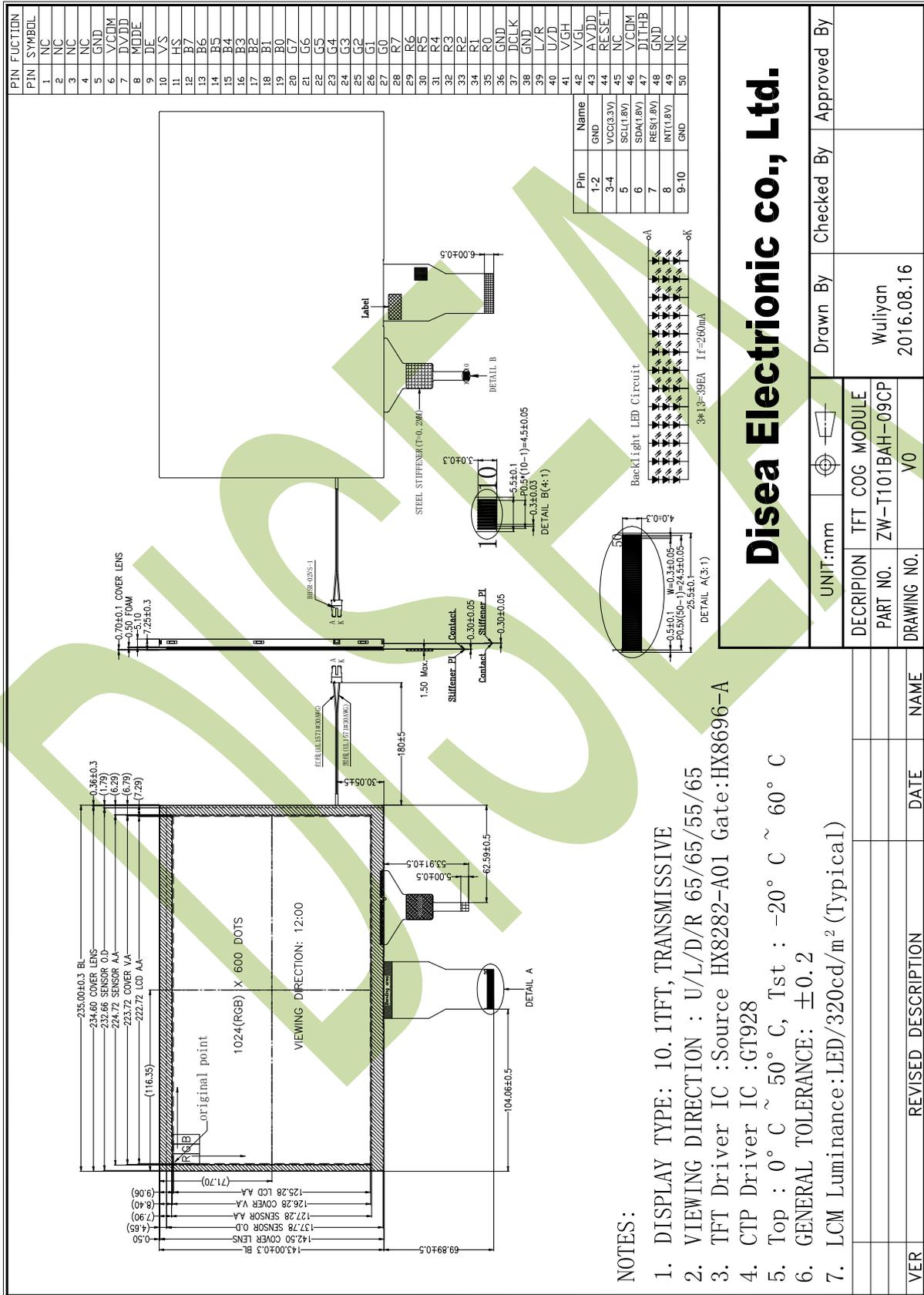
ZW-T101BAH-09CP is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light and CTP unit. The 10.1" display area contains 1024X(RGB)x600 pixels and can display up to 16.7M colors. This product accords with ROHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	16.7M	Color	1
Viewing Direction	12	O'Clock	
Grey scale inversion	6	O'Clock	
Operating temperature	0~+50	°C	
Storage temperature	-20~+60	°C	
Module size	235.00X143.00X7.25	mm	2
Active Area(W×H)	222.72X125.28	mm	
Number of Dots	1024×600	dots	
Controller	HX8282-A01+HX8696-A	-	
IC Controller	GT928	-	
Power Supply Voltage	3.3	V	
Backlight	3S13P-LEDs (white)	pcs	
Weight	---	g	
Interface	RGB888	-	

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

Note 2: Without FPC and Solder. With CTP.

4.Outline.Drawing



Disea Electronic co., Ltd.

- NOTES:**
1. DISPLAY TYPE: 10.1TFT, TRANSMISSIVE
 2. VIEWING DIRECTION : U/L/D/R 65/65/55/65
 3. TFT Driver IC :Source HX8282-A01 Gate:HX8696-A
 4. CTP Driver IC :GT928
 5. Top : 0° C ~ 50° C, Tst : -20° C ~ 60° C
 6. GENERAL TOLERANCE: ±0.2
 7. LCM Luminance:LED/320cd/m² (Typical)

UNIT:mm		Drawn By	Checked By	Approved By
DECRIPION	TFT COG MODULE			
PART NO.	ZW-TT01BAH-09CP	Wuliyan		
DRAWING NO.	V0	2016.08.16		
VER	REVISED DESCRIPTION	DATE	NAME	

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	DVDD	-0.5	3.96	V	1,2
	AVDD	-0.5	14.85		
	VGH	-0.3	42		
	VGL	-25	0.3		
	CTP_VCC	2.66	3.47		

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 handling LCD Module.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-20°C	60°C	0°C	50°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 .

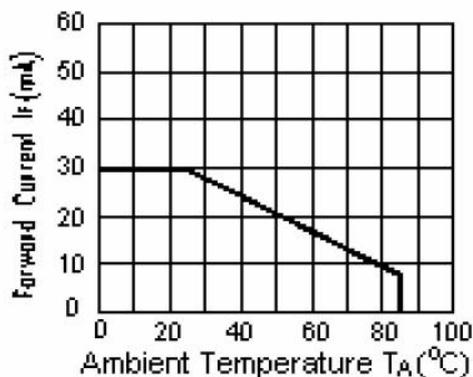
6. Electrical Specifications

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit	
Power Supply Voltage	DVDD	$T_a=25^\circ C$	3.0	3.3	3.6	V	
	AVDD	$T_a=25^\circ C$	10.2	10.5	10.8		
	VGH	$T_a=25^\circ C$	20	21	22		
	VGL	$T_a=25^\circ C$	-5.0	-5.5	-6.0		
	CTP_VCC	$T_a=25^\circ C$	2.8	-	3.3		
Common PowerSupply Voltage	VCOM	$T_a=25^\circ C$	3.3	3.7	4.2		
Input voltage	'H'	V_{IH}	$T_a=25^\circ C$	$0.7 \cdot DVDD$	-	DVDD	
	'L'	V_{IL}	$T_a=25^\circ C$	0	-	$0.3 \cdot DVDD$	

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

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Voltage for Backlight	V_f	$I_f=260mA$	8.1	9.0	9.9	V	
Power Consumption	P	$I_f=260mA$	2106	2340	2574	mW	
Uniformity	ΔBp	$I_f=260mA$	75	80	-	%	
Life Time	time	$I_f=260mA$	20K	-	-	hours	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

Pin No.	Symbol	I/O	Function
1-4	NC	-	No connection.
5	GND	P	Ground.
6	VCOM	P	Common voltage input
7	DVDD	P	Power for digital Circuit
8	MODE	I	DE or HV mode control
9	DE	I	Data Enable
10	VS	I	Vertical Sync input
11	HS	I	Horizontal Sync input.
12-19	B7-B0	I	Blue data input
20-27	G7-G0	I	Green data input
28-35	R7-R0	I	Red data input
36	GND	P	Ground
37	DCLK	I	Sample clock
38	GND	P	Ground
39	L/R	I	Select left to right scanning direction
40	U/D	I	Select up or down scanning direction
41	VGH	P	Gate on voltage
42	VGL	P	Gate off voltage
43	AVDD	P	Power for analog circuit
44	RESET	I	Reset the display,active "L"
45	NC	-	No Connection
46	VCOM	I	Common voltage input
47	DITHB	I	Dithering function enable control.
48	GND	P	Ground.
49-50	NC	-	No connection.

CTP Controller

Pin No	Symbol	I/O	Function
1-2	GND	P	Ground
3-4	VCC3.3V	P	CTP Power supply
5	SCL(1.8V)	I	I2C clock
6	SDA(1.8V)	I	I2C Serial
7	RES(1.8V)	I	CTP reset pin,active "L"
8	INT(1.8V)	I	External Interrupt to the IC of CTP
9-10	GND	P	Ground

6.4 AC Characteristics

6.4.1 AC electrical characteristics

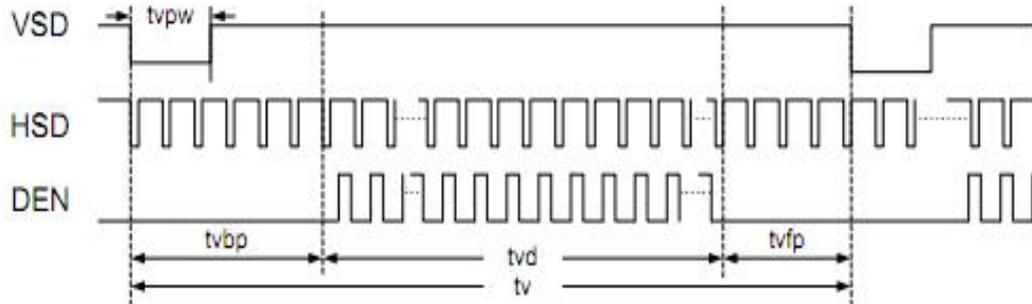
TTL mode AC electrical characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
VDD power on slew rate	T_{POR}	From 0V to 90% VDD	-	-	20	ms
GRB pulse width	T_{GRB}	-	50	-	-	μ s
DCLK cycle time	T_{cph}	-	14	-	-	ns
DCLK pulse duty	T_{cwh}	-	40	50	60	%
VSD setup time	T_{vst}	-	5	-	-	ns
VSD hold time	T_{vhd}	-	5	-	-	ns
HSD setup time	T_{hst}	-	5	-	-	ns
HSD hold time	T_{nhd}	-	5	-	-	ns
Data setup time	T_{dsu}	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
Data hold time	T_{dhd}	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
DE setup time	T_{esu}	-	5	-	-	ns
DE hold time	T_{ehd}	-	5	-	-	ns
Output stable time	T_{sst}	10% to 90% target voltage. CL=90pF, R=10K Ω (Cascade)	-	-	6	μ s
		Dual gate	-	-	3	

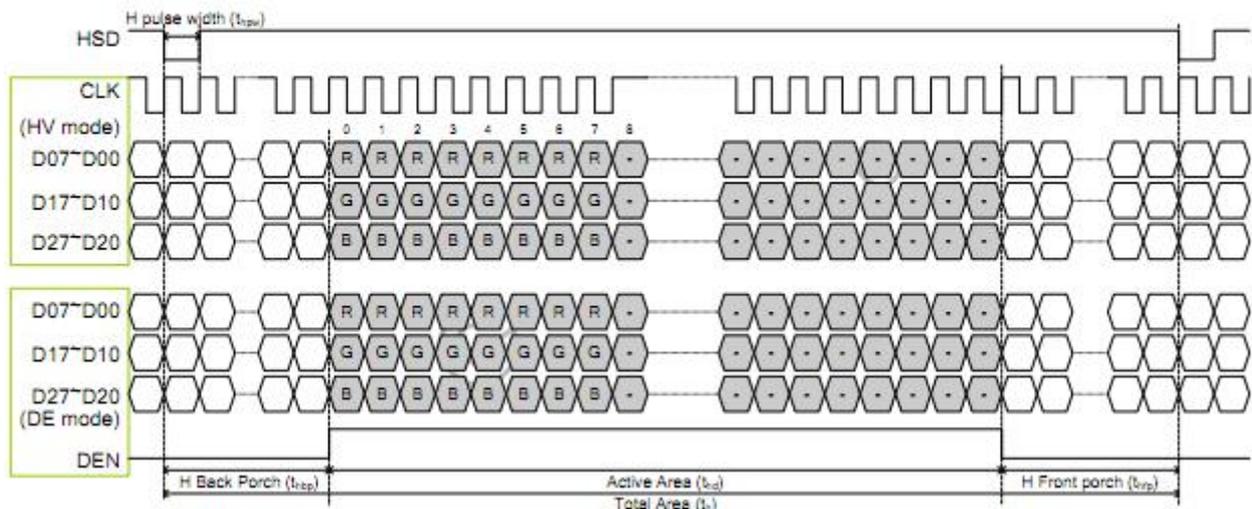
6.4.2 Data input format

TTL mode data input format

- Vertical timing



- Horizontal timing



6.4.3 Parallel RGB input timing table

Resolution: 1024x600

DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			T _H
VSD period	tv	610	635	800	T _H
VSD blanking	tvbp+tvfp	10	35	200	T _H

HV mode

• Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	44.9	51.2	63	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1200	1344	1400	DCLK
HSD pulse Width	thpw	1	-	140	DCLK
HSD back porch	thbp	160			DCLK
HSD front porch	thfp	16	160	216	DCLK

• Vertical timing

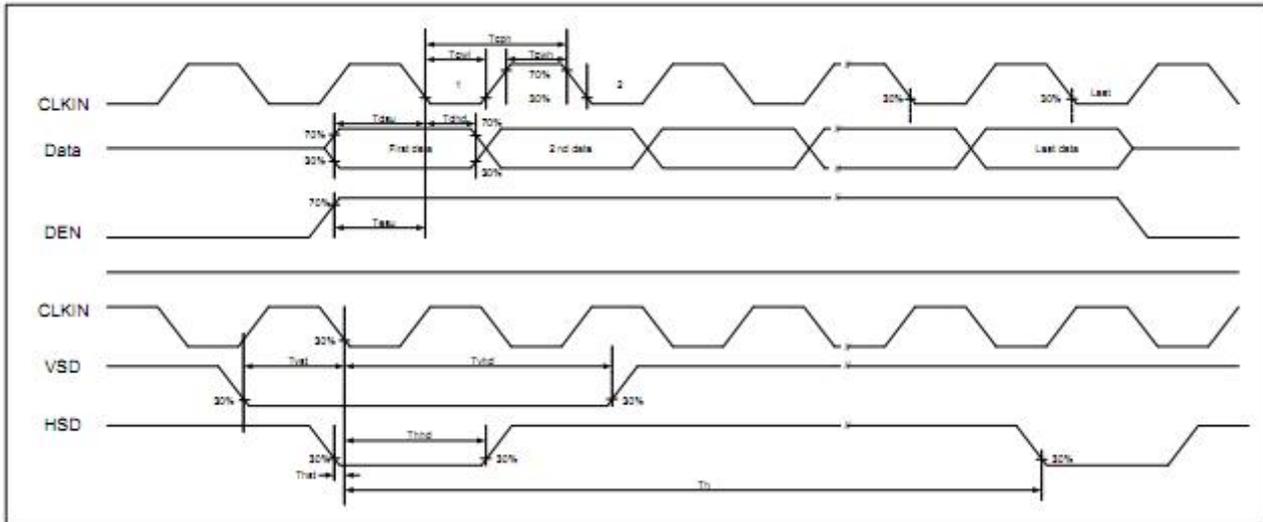
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			T _H
VSD period	tv	624	635	750	T _H
VSD pulse width	tvpw	1	-	20	T _H
VSD back porch	tvbp	23			T _H
VSD front porch	tvfp	1	12	127	T _H

6.4.4 Timing

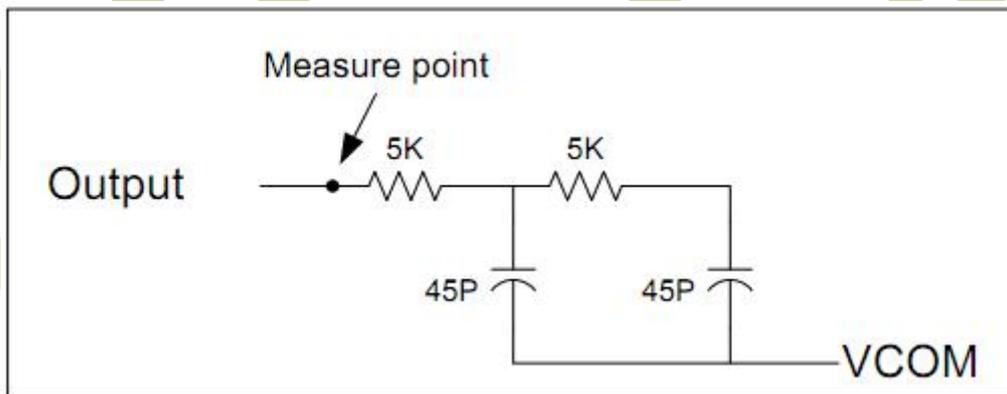
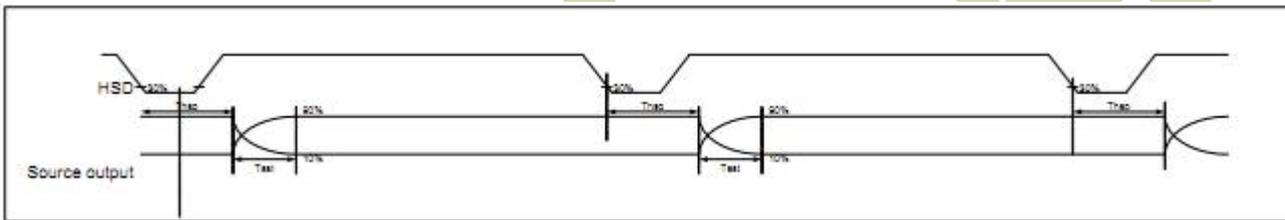
6.4.4.1 Output timing table

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
CLKIN frequency	Fclk	VDD=3.0V~3.6V	-	65	71	MHz
CLKIN cycle time	Tclk	-	14.1	15.4	-	ns
CLKIN pulse duty	Tcwh	Tclk	40	50	60	%
Time from HSD to source output	Thso	-	64			CLKIN
Time from HSD to LD	Thld	-	64			CLKIN
Time from HSD to STV	Thstv	-	2			CLKIN
Time from HSD to CKV	Thckv	-	20			CLKIN
Time from HSD to OEV	Thoev	-	4			CLKIN
LD pulse width	Twld	-	10			CLKIN
CKV pulse width	Twckv	-	66			CLKIN
OEV pulse width	Twoev	-	74			CLKIN

6.4.4.2 Input clock and data timing diagram



6.4.4.3 Source output timing diagram (Cascade)



Output load condition

7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp	$\theta=0^\circ$ $\Phi=0^\circ$	-	320	-	Cd/m ²	1
Uniformity	Δ Bp		75	80	-	%	1,2
Viewing Angle	3:00	Cr \geq 10	-	65	-	Deg	3
	6:00		-	55	-		
	9:00		-	65	-		
	12:00		-	65	-		
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$	-	600	-	-	4
Response Time	T _r +T _f	$\theta=0^\circ$ $\Phi=0^\circ$	-	20	-	ms	5
Color of CIE Coordinate	W	x	Typ. -0.05	TBD	Typ. +0.05	-	1,6
		y		TBD		-	
	R	x		TBD		-	
		y		TBD		-	
	G	x		TBD		-	
		y		TBD		-	
	B	x		TBD		-	
		y		TBD		-	
NTSC	S	-	50	-	%		

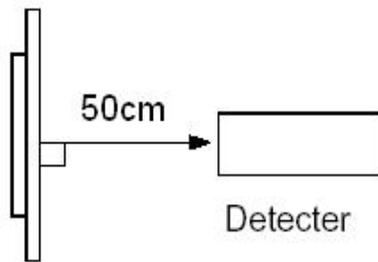
Note: The parameter is slightly changed by temperature, driving voltage and materiel

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: $T_a=25\text{ }^\circ\text{C}$.
- 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.

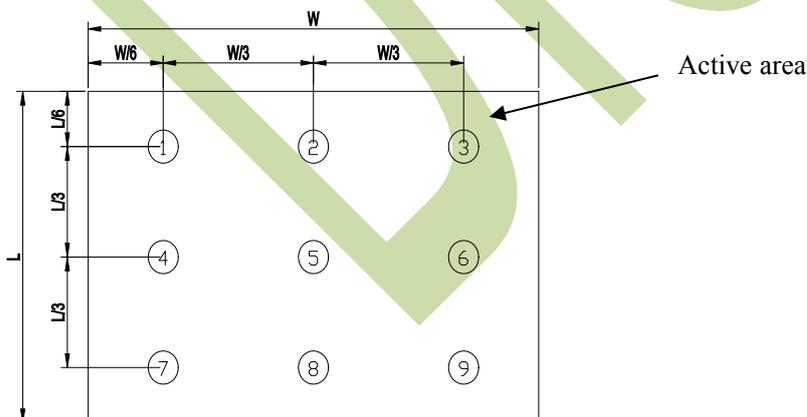


Note 2: The luminance uniformity is calculated by using following formula.

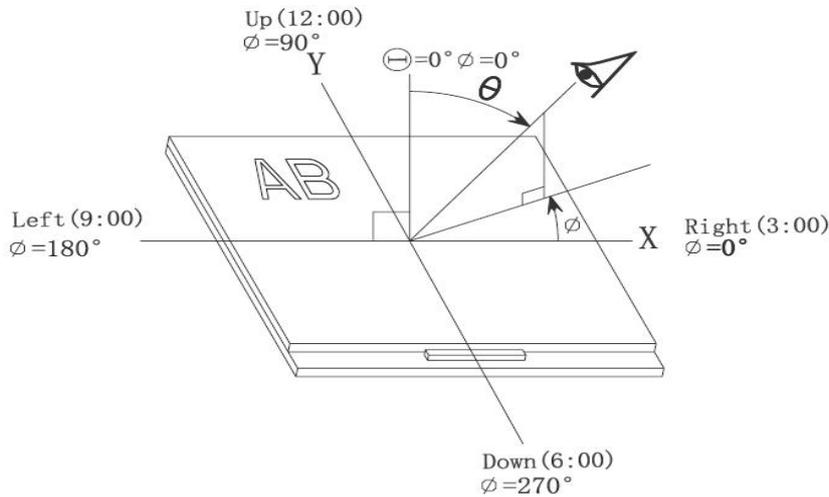
$$\Delta B_p = B_p (\text{Min.}) / B_p (\text{Max.}) \times 100 (\%)$$

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

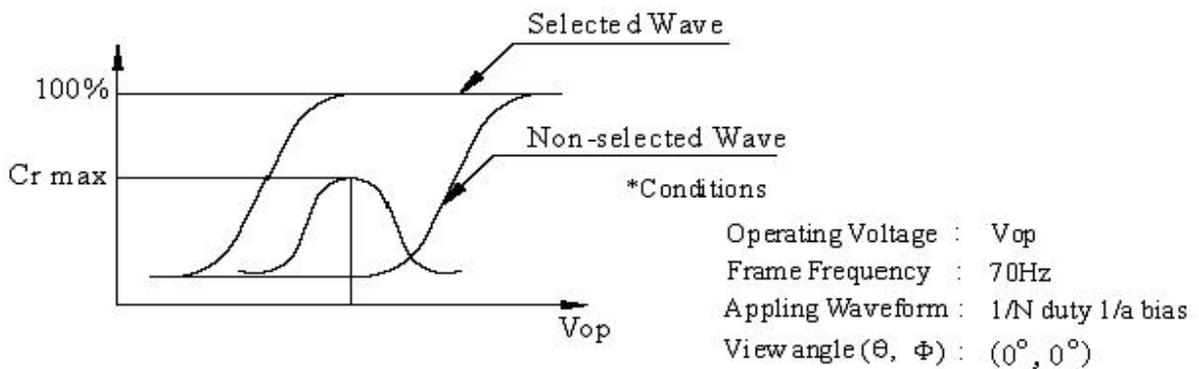
$B_p (\text{Min.})$ = Minimum brightness in 9 measured spots.



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



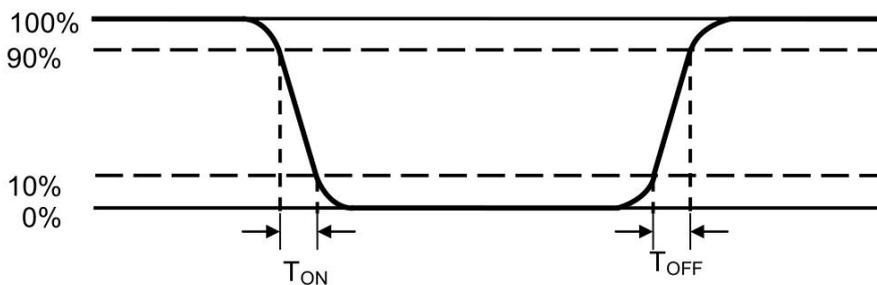
Note 4: Definition of contrast ratio. (Test LCD using DMS501)



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

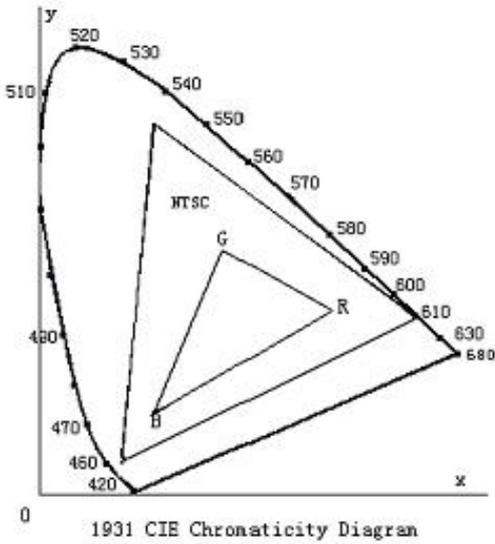
Note 5: Definition of Response time. (Test LCD using DMS501):

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



The definition of response time

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

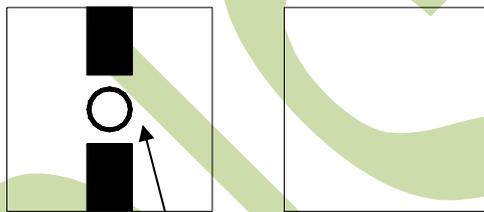


Color gamut:

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

Note 7: Definition of cross talk.

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



Pattern A

Pattern B

Measurement point(center)

Electric volume value = $3F \pm 3Hex$

8. Reliability Test Items and Criteria

Test Item	Test condition	Remark
High Temperature Storage	Ta = 60°C 96hrs	Note1,Note3,4
Low Temperature Storage	Ta = -20°C 96hrs	Note1,Note3,4
High Temperature Operation	Ts = 50°C 96hrs	Note2,Note3,4
Low Temperature Operation	Ta = 0°C 96hrs	Note1,Note3,4
Operation at High Temperature/Humidity	+40°C, 90%RH 96hrs	Note3,Note4
Thermal Shock	-20°C/30 min ~ +60°C/30 min for a total 10 cycles, Start with cold temperature and end with high temperature.	Note3,Note4
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	±2KV, Human Body Mode, 100pF/1500Ω	

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

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