DLC Display Co., Limited

德爾西顯示器有限公司

MODEL No: DLC1500AMG-T-1

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Record of Revision

Date	Revision No.	Summary
2011-09-08	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC1500AMG-T-1 active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, TCON, Touch panel and a backlight unit. The 15.0" Display area contains 1024(RGB) X 768 pixels.

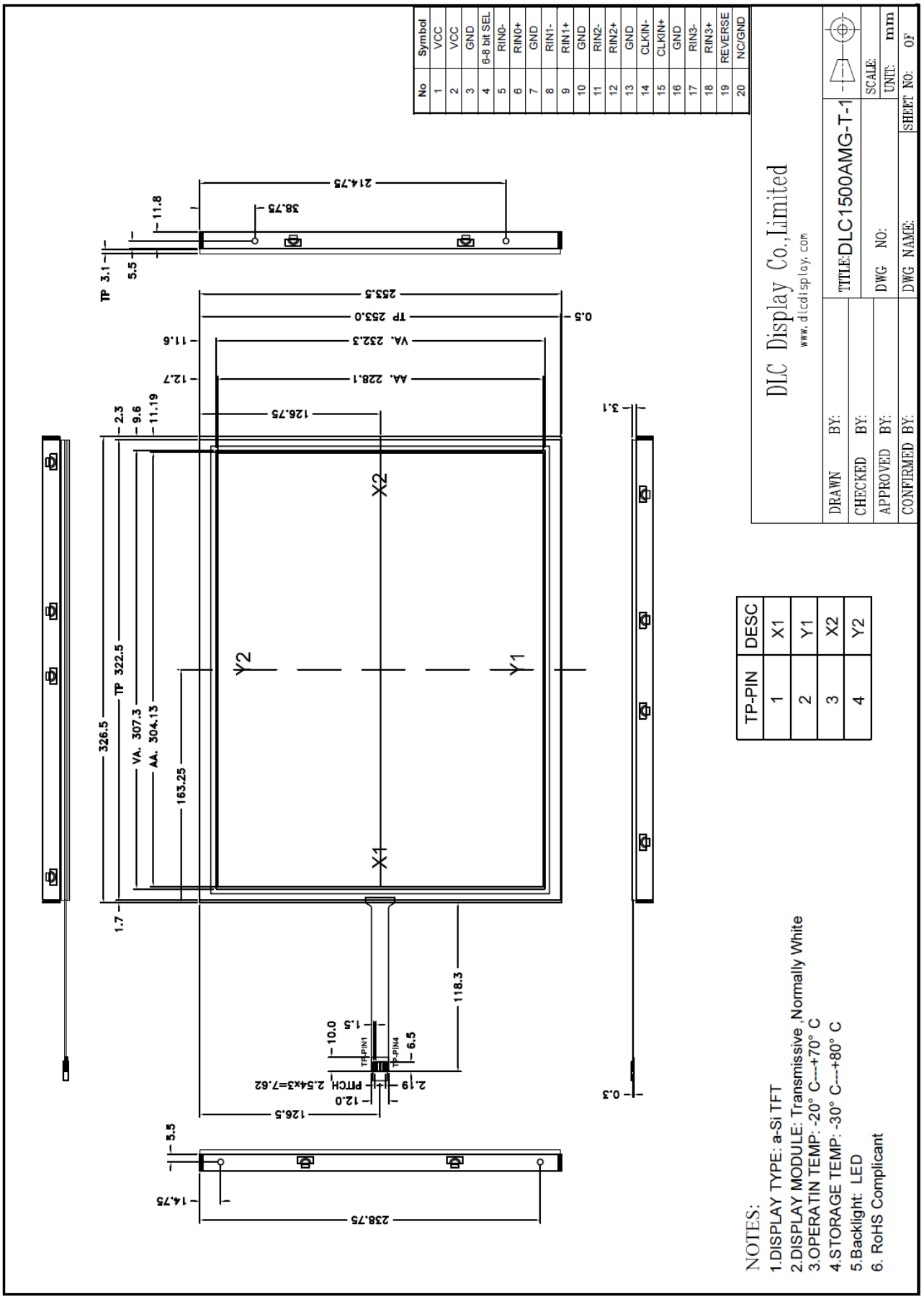
2. Application

Digital equipments which need color display, monitor, POS, video systems.

3. General Information

Item	Contents	Unit
Size	15.0	inch
Resolution	1024(RGB) X 768	/
Interface	LVDS	/
Technology type	a-Si TFT	/
Pixel pitch	0.297x0.297	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	326.50x 253.5 x 15.4	mm
Active Area	304.13 x 228.10	mm
Display Mode	Transmissive Normally White	/
Backlight Type	White-LED	/

4. Outline Drawing



5. Interface signals

5.1 CN1 for LVDS

No	Symbol	Description	Remarks
1	VCC	3.3V Power Supply	
2	VCC	3.3V Power Supply	
3	GND	Power Ground	
4	6-8 bit SEL	Select 6 or 8 bits LVDS input (“H”: 8 bits; GND/NC: 6 bits)	
5	RIN0-	Negative (-) LVDS differential data input	
6	RIN0+	Positive (+) LVDS differential data input	
7	GND	Power Ground	
8	RIN1-	Negative (-) LVDS differential data input	
9	RIN1+	Positive (+) LVDS differential data input	
10	GND	Power Ground	
11	RIN2-	Negative (-) LVDS differential data input	
12	RIN2+	Positive (+) LVDS differential data input	
13	GND	Power Ground	
14	CLKIN-	Clock Signal (-)	
15	CLKIN+	Clock Signal (+)	
16	GND	Power Ground	
17	RIN3-	Negative (-) LVDS differential data input (Used for 8 bits LVDS input, NC for 6 bits)	
18	RIN3+	Positive (+) LVDS differential data input (Used for 8 bits LVDS input, NC for 6 bits)	
19	NC/GND	Test function pin (don’t set this pin to High)	
20	NC/GND	Test function pin (don’t set this pin to High)	Low or Open

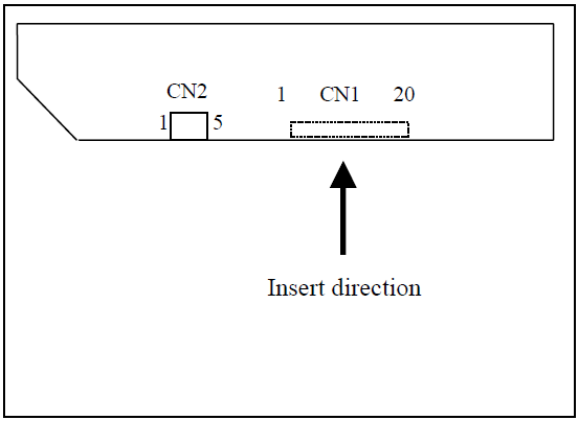
CN1: 185083-20121-1 (Produced by Dachang) or equivalent.

5.2 CN2 for LED Backlight

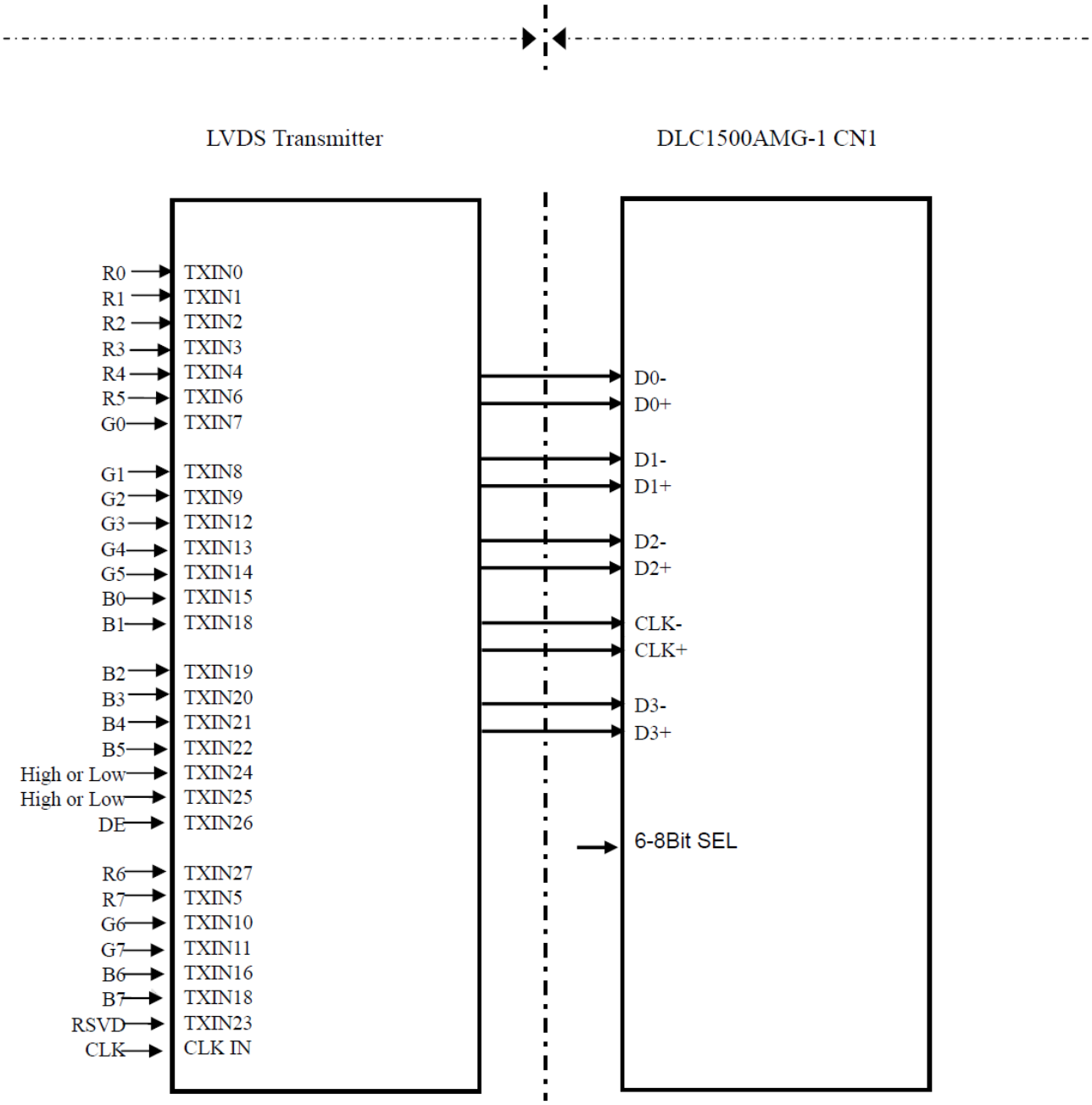
No	Symbol	Description	Remark
1	VCC	12V	
2	GND	GND	
3	Enable	5V-On / 0V-Off	
4	Dimming	PWM Dimming or Analog Dimming	
5	NC	NC	

CN2: MSB24038P5 (Produced by STM) or equivalent..

5.3 Position of plugs and a socket



5.4 Connection between receiver and transmitter for LVDS



Note1: The lowest bit (RA0, GA0, BA0, RB0, GB0, BB0), the most upper bit (RA7, GA7, BA7, RB7, GB7, BB7)

Note2: Connecting cable between LCD panel's connector and transmitter should use 100Ω twisted line.

Note3: If only Hsync and Vsync, the product don't work. Make sure DE signal has been input.

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VCC	-0.3	6.0	V	Ta=25℃
Input voltage for signals	Vi	-0.3	3.3	V	Ta=25℃
Light bar peak forward current	IF	--	150	mArms	

Note1: Display signals are DA0+/-, DA1+/-, DA2+/-, DA3+/- and CKA+/-, DB0+/-, DB1+/-, DB2+/-, DB3+/- and CKB+/-.

Note2: Function signal is MSL.

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	℃	
Storage Temperature	TSTG	-30	80	℃	

7. Electrical Specifications

7.1 Electrical characteristics for LCD

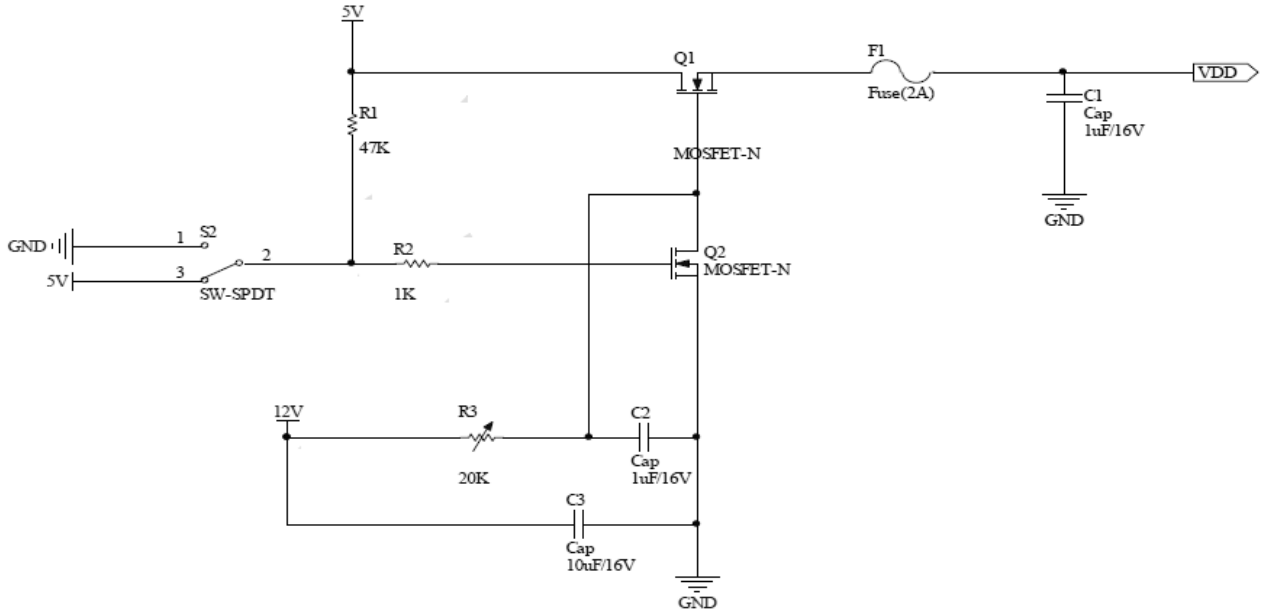
GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply Voltage		VCC	3.0	3.3	3.6	V	
Power Supply Current		ICC	--	--	325 Note 1	mA	At VCC=3.3V
Permissible ripple voltage		VRP	--	--	100	mV	For VCC
Differential input voltage		| Vid |	250	--	450	mV	--
Differential input Threshold voltage for LVDS receiver	Low Level	VTL	-100	--	--	mV	at VCM = 1.25V Note 2
	High Level	VTH	-	--	100	mV	
Input voltage width for LVDS receiver		Vi	0	--	2.4	V	--
Rush current		Irush	--	--	1.5	A	Note 3
Terminating resistor		RT	--	100	--	Ω	--

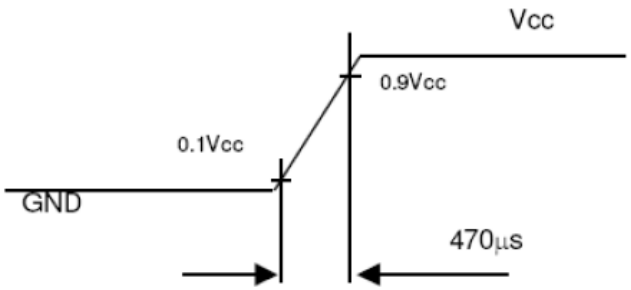
Note1: All black pattern;

Note2: Common mode voltage for LVDS receiver;

Note 3: Measurement Conditions:



Vcc rising time is 470μs



7.2 Drive for Backlight

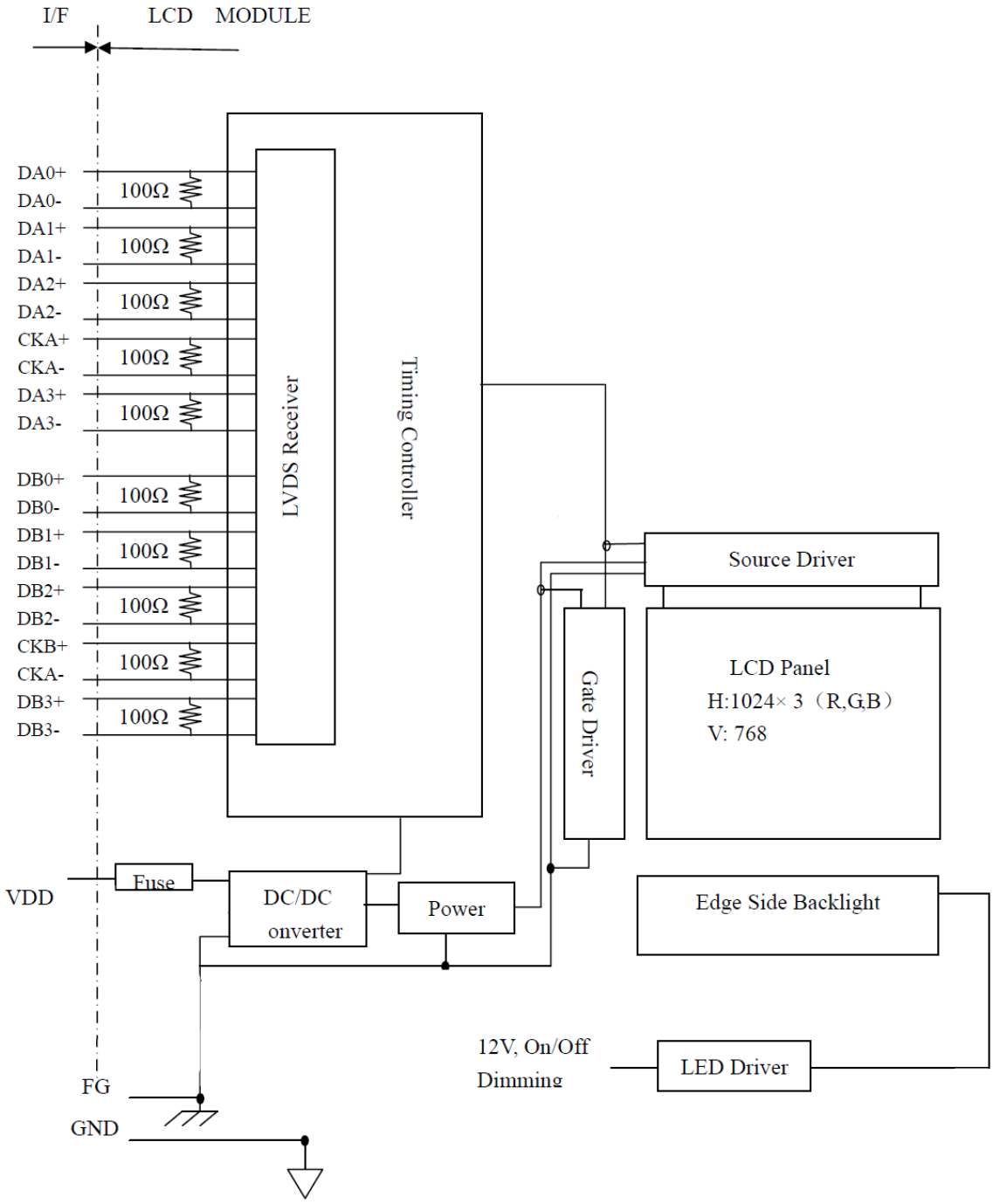
Ta=25℃

Parameter	Symbol	min.	typ.	max.	Unit	Remarks
Light bar operation current	ILED	--	80	--	mArms	Note 1
Light bar operation Voltage	VLED	17.5	--	23.1	Vrms	Operating with fixed driving current

Note1: The backlight of this product is made up of 1 light bar, LED to be 3020, 28 pieces, 7 serials and 2x2 parallels.

Note2: The light bar can work normally if the PWM dimming ratio range is from 0% to 100% and the operation current is 80mA.

7.3 Block Diagram



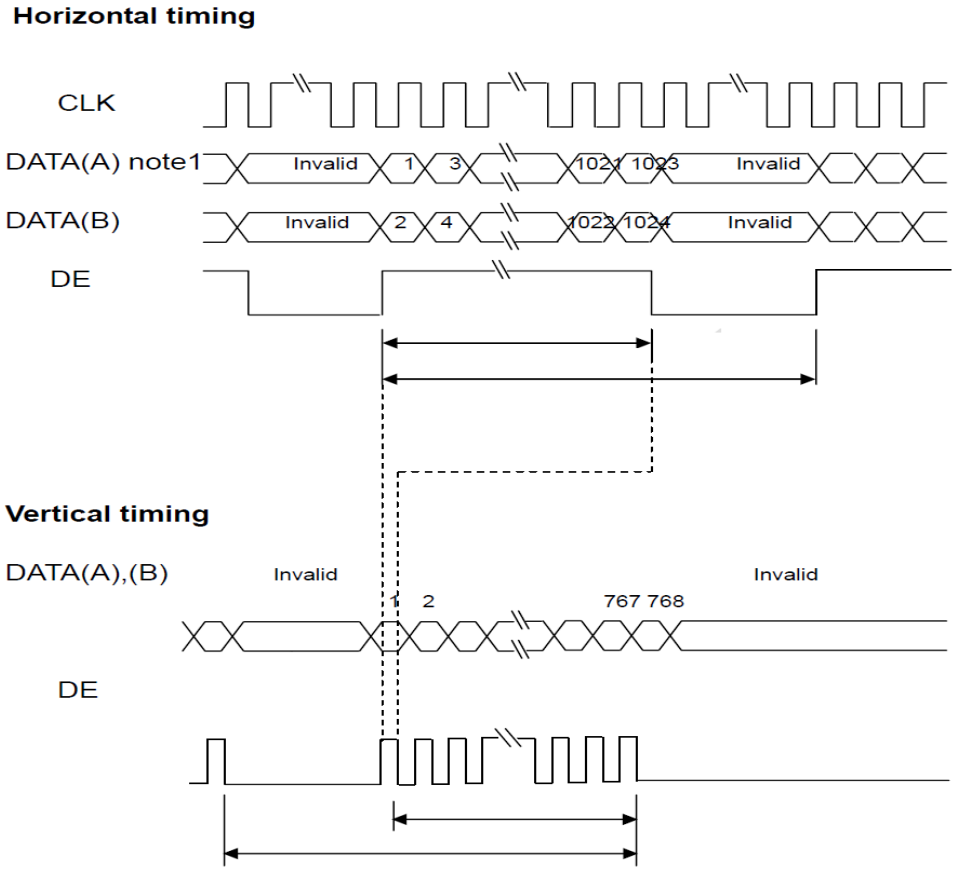
Note: System ground (GND), FG (Frame ground) in the product should be connected together in customer equipment.

8. Command/AC Timing

8.1 Interface Timing Chart

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Clock	Frequency	tc	16.8	15.4	12.31	ns	LVDS transmitter input
		1/tc	59.58	65.0	81.25	MHz	
	Rise time, Fall time	--	Refer to the timing characteristics of LVDS transmitter			ns	See the data sheet of LVDS transmitter
	Duty	--				--	
Horizontal signals	Cycle	th	15	20.676	26.5	μs	55.5KHz(typ.)
			1050	1344	1800	CLK	
	Display period	thd	1024			CLK	--
Vertical signals	Cycle	tv	13.1	16.67	20	ms	60.0Hz（typ.）
			770	806	1334	H	
	Display period	tvd	768			H	
DE/Data	Setup time	--	Refer to the timing characteristics of LVDS transmitter			ns	See the data sheet of LVDS transmitter
	Hold time	--				ns	
	Rise time, Fall time	--				ns	

8.2 Input signal timing chart



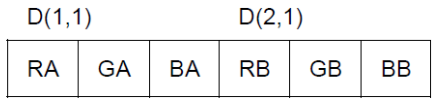
Note: DATA(A) =RA0-RA7,GA0-GA7,BA0-BA7; DATA(B) =RB0-RB7,GB0-GB7,BB0-BB7

8.3 Pixel DATA alignment of display image

The following chart is the coordinates of per pixel

Odd Pixel: RA= R DATA
GA= G DATA
BA= B DATA

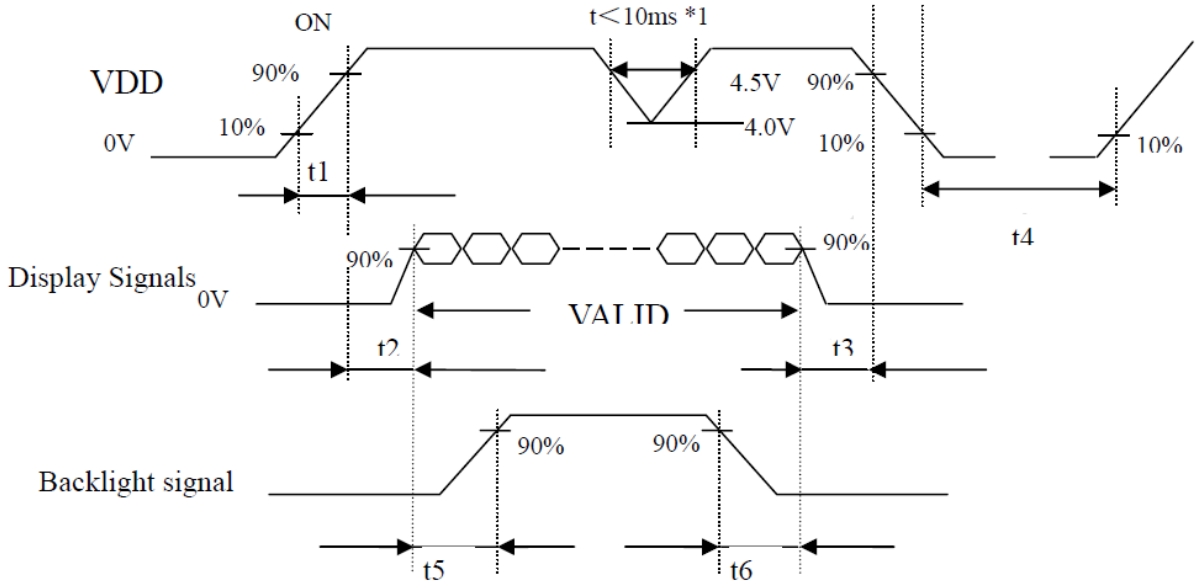
Even Pixel : RB=R DATA
GB=G DATA
BB=B DATA



D(1,1)	D(2,1)	D(3,1)	•••	D(1024,1)
D(1,2)	D(2,2)	D(3,2)	•••	D(1024,2)
D(1,3)	D(2,3)	D(3,3)	•••	D(1024,3)
• • •	• • •	• • •	••• ••• •••	• • •
D(1,768)	D(2,768)	D(3,768)	•••	D(1024,768)

8.4 POWER SUPPLY VOLTAGE SEQUENCE

8.4.1 The sequence of backlight and power



Timing Specifications:

t1: 0.47ms<t1 <10ms; t2: 0.5 ms<t2 <50ms; t3: 0ms<t3 <50ms;
t4: t4 >1000ms; t5: t5 >200ms; t6: t6 >200ms.

*1. When VDD is on, but the value is lower than 4.5V, a protection circuit may work, then the module may not display.
*2. The signal line is not connected with the module, at the end of cable the terminal resistor of 100Ω

should be added.

Note1: Display signals (D0+/-, D1+/-, D2+/-, D3+/- and CK+/-) must be “0” voltage, exclude the VALID period (See above sequence diagram). If these signals are higher than 0.3 V, the internal circuit is damaged. If some of display signals of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If customer stops the display signals, they should cut VDD.
Note2: When VDD is on, it should be set above 4.0V.
Note3: The backlight power supply voltage should be inputted within the valid period of display and function signals, in order to avoid unstable data display.

8.4.2 Power supply voltage ripple

When the power supply is designed, the next form can give the reference. If the voltage ripple is over the value in next form, the noise should be seen in display area.

Ripple (Measured at input terminal of power supply)

Parameter	VCC (3.3V to drive the panel)
Ripple voltage	≤ 200mVP-P (including spike noise)

8.4.3 Fuse

Parameter	**Fuse**		**Rating**	**Fusing current**	**Remark**
	Type	**Supplier**			
VCC	FCC16152ABTP	KAMAYA	1.5 A	--	Note
			36 V		

Note: There are different power supply systems from the power input terminal. The power supply capacity should be less than the fusing current. If the power supply capacity is above the fusing current, the fuse may blow in a short time, and then nasty smell, smoking and so on may occur.

8.5 DISPLAY COLORS AND INPUT DATA SIGNALS

This product can display in equivalent to 16,777,216 colors in 256 scales. Also the relation between display colors and input data signals is as the following table.

Display colors		Data signal (0:Low level, 1:High Level)																									
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dark ↑	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:				:								:								:				
	↓				:								:								:				
	Bright	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Dark ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:				:								:								:				
	↓				:								:								:				
	Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Dark ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:				:								:								:				
	↓				:								:								:				
	Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

9. Optical Specification

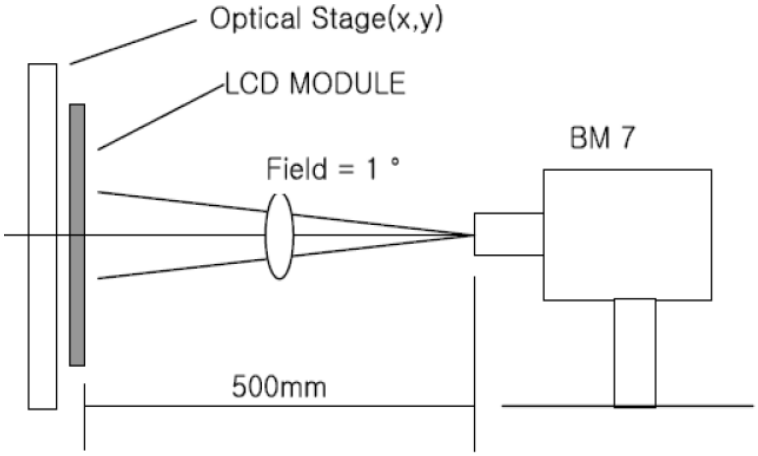
Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	θ=0°	400	600	--		Note1 Note2
Response Time		Ton + Toff	25℃	--	8	--	ms	Note1 Note3
View Angles		ΘT	CR≧10	--	80	--	Degree	Note 4
		ΘB		--	80	--		
		ΘL		--	80	--		
		ΘR		--	80	--		
Chromaticity	White	x	Brightness is on	0.283	0.313	0.343		Note5, Note1
		y		0.299	0.329	0.359		
Luminance		L		250	300	--	cd/m^2	Note1 Note6
Uniformity		U		--	80	--	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25℃(±3℃)

LED back-light: ON, Environment brightness < 150 lx

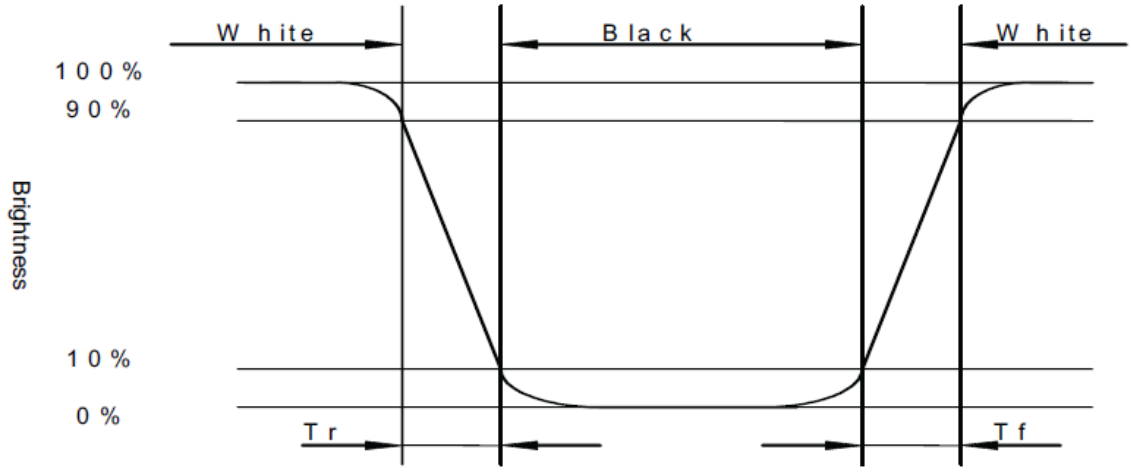


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

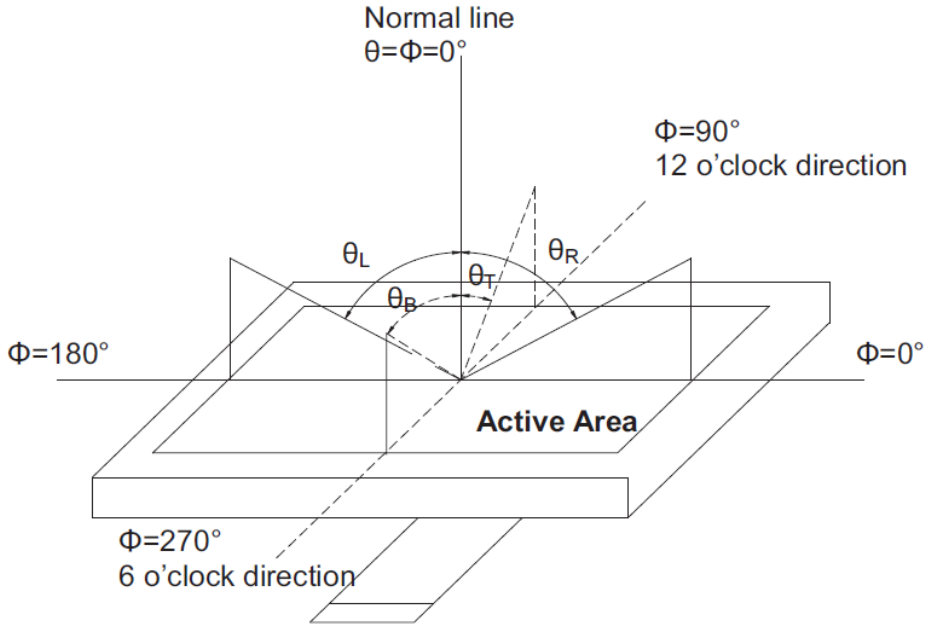
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time, Tr) and from white to black(Decay Time, Tf).



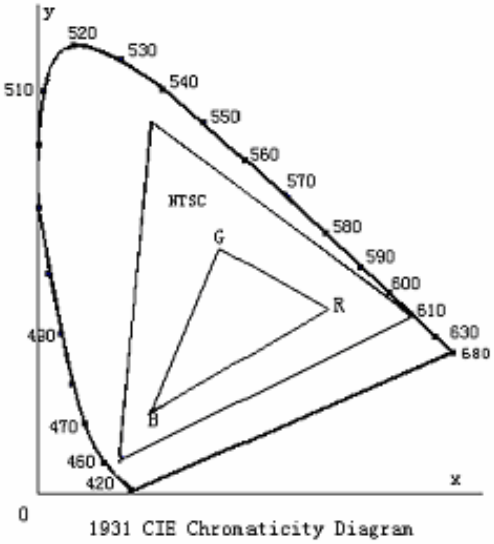
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



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

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity(U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

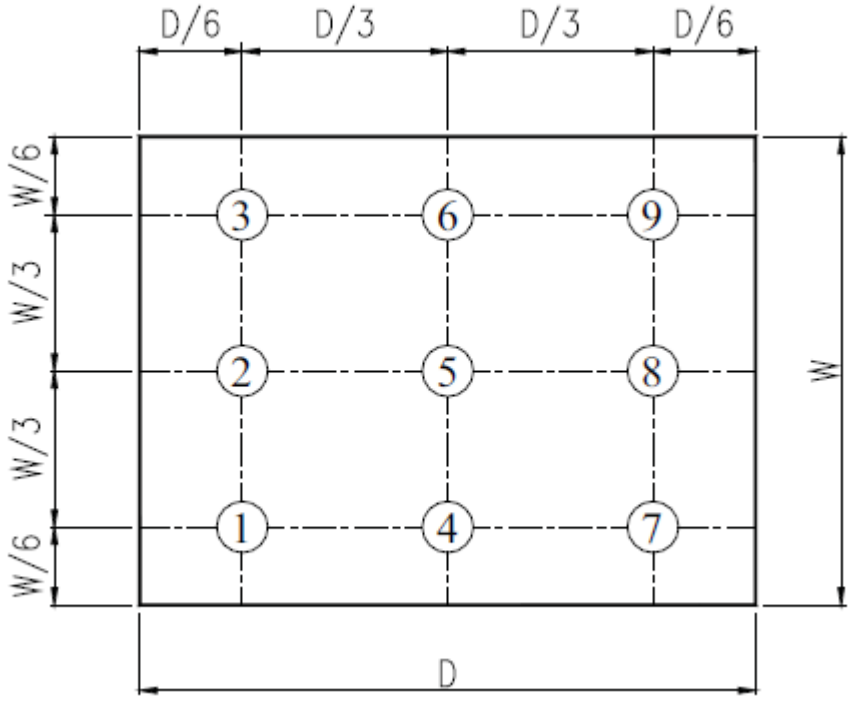


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70℃, 240hrs	Per table in below
2	Low Temp Operation	Ta=-20℃, 240hrs	Per table in below
3	High Temp Storage	Ta=+80℃, 240hrs	Per table in below
4	Low Temp Storage	Ta=-30℃, 240hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60℃, 90% RH 240 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 100 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω，5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of LCD Modules

11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability
C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.
D. Provide a space so that the panel does not come into contact with other components.
E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.
G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

A. Ground soldering iron tips, tools and testers when they are in operation.
B. Ground your body when handling the products.
C. Power on the LCD module before applying the voltage to the input terminals.
D. Do not apply voltage which exceeds the absolute maximum rating.
E. Store the products in an anti-electrostatic bag or container.

11.4Storage

A. Store the products in a dark place at +25℃±10℃ with low humidity (40% RH to 60% RH).
Don't expose to sunlight or fluorescent light.
B. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

A. Do not wipe the touch panel with dry cloth, as it may cause scratch.
B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area.
A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.