

DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No: DLC0273ADP10SF-1

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Record of Revision

Date	Revision No.	Summary
2024-01-23	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC0273ADP10SF-1 active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The 2.73" display area contains 320(RGB) x 320 pixels.

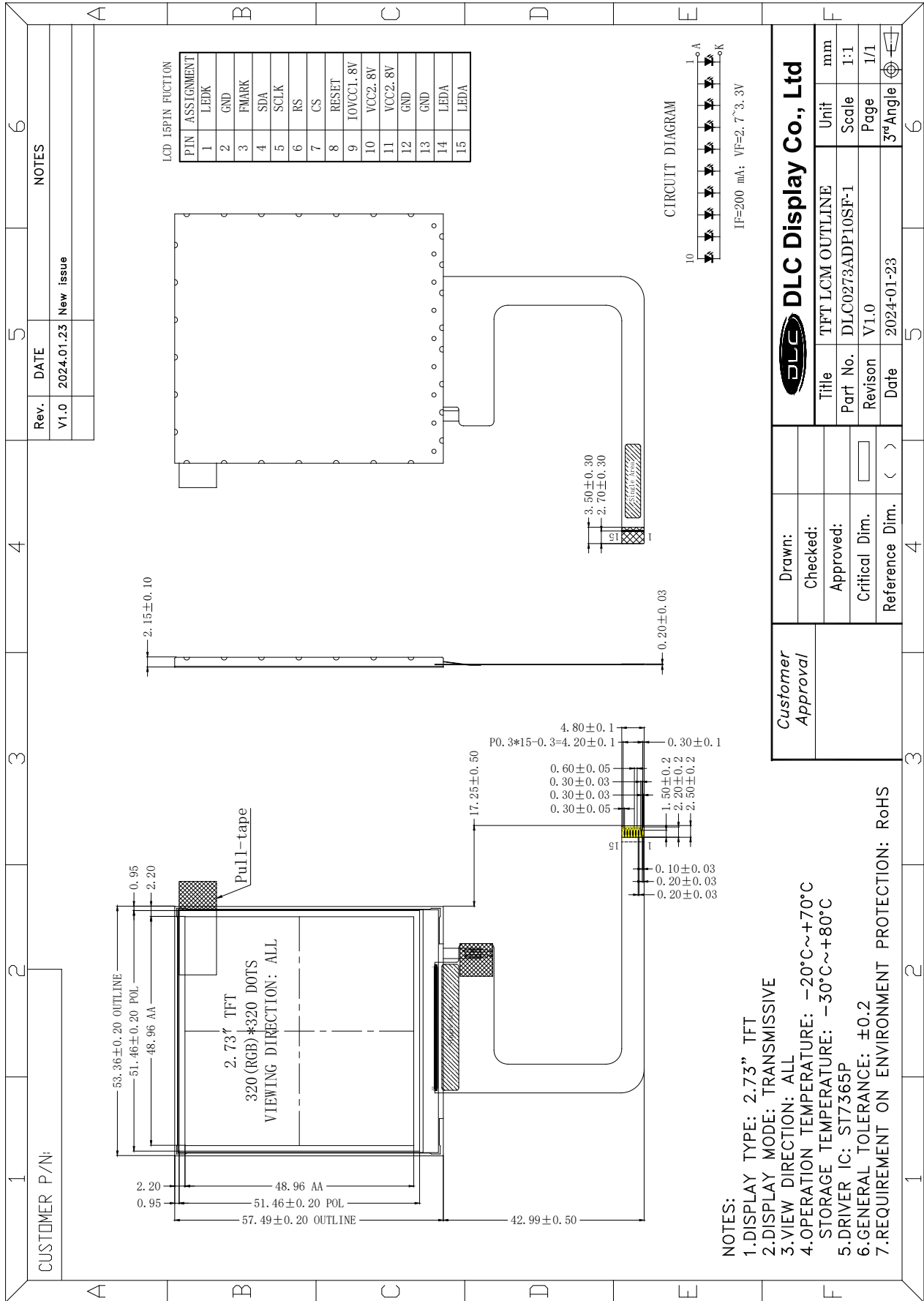
2. Application

Digital equipments which need color display outdoor, mobile navigator/video systems.

3. General Information

Item	Contents	Unit
Size	2.73	inch
Resolution	320(RGB) x 320	/
Interface	SPI	/
Technology type	IPS	/
Pixel pitch	0.153 x 0.153	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	53.36 x 57.49 x 2.15	mm
Active Area	48.96 x 48.96	mm
Display Mode	Transmissive	/
Viewing Direction	ALL	/
Driver IC	ST7365P	
Backlight Type	LED	/
Weight	TBD	/

4. Outline Drawing



5. Interface signals

No	Symbol	Description	Remarks
1	LEDK	LED backlight Cathode	
2	GND	Ground	
3	FMARK	Tearing effect output	
4	SDA	SPI interface input/output pin	
5	SCLK	Serial clock pin	
6	RS	Display data/command selection (RS) pin in MCU interface.	
7	CS	Chip selection pin. Low-active.	
8	RESET		
9	IOVCC1.8V		
10	VCC2.8V		
11	VCC2.8V		
12	GND		
13	GND	Power supply	
14	LEDA	LED backlight Anode	
15	LEDA	LED backlight Anode	

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VCC	-0.3	4.6	V	
	IOVCC	-0.3	4.6	V	

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.

6.2.Environment Conditions

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

7. Electrical Specifications

7.1 Electrical characteristics

GND=0V, Ta=25°C

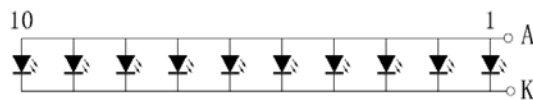
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage	VCC	2.4	2.75	3.3	V	
	IOVCC	1.65	1.8	3.3	V	
LCD drive power current	ILCD	-	15	-	mA	
Input voltage	"H"	V _{IH}	0.7*IOVCC	-	IOVCC	V
	"L"	V _{IL}	GND	-	0.3*IOVCC	V

7.2 LED Backlight

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward supply voltage	V _F	2.7	-	3.3	V	
Forward supply current	I _F	-	200	-	mA	
Life time	-	30,000	-	-	Hrs	Note

Note: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IF=200mA. The LED life time could be decreased if operating IF is larger than 200mA.

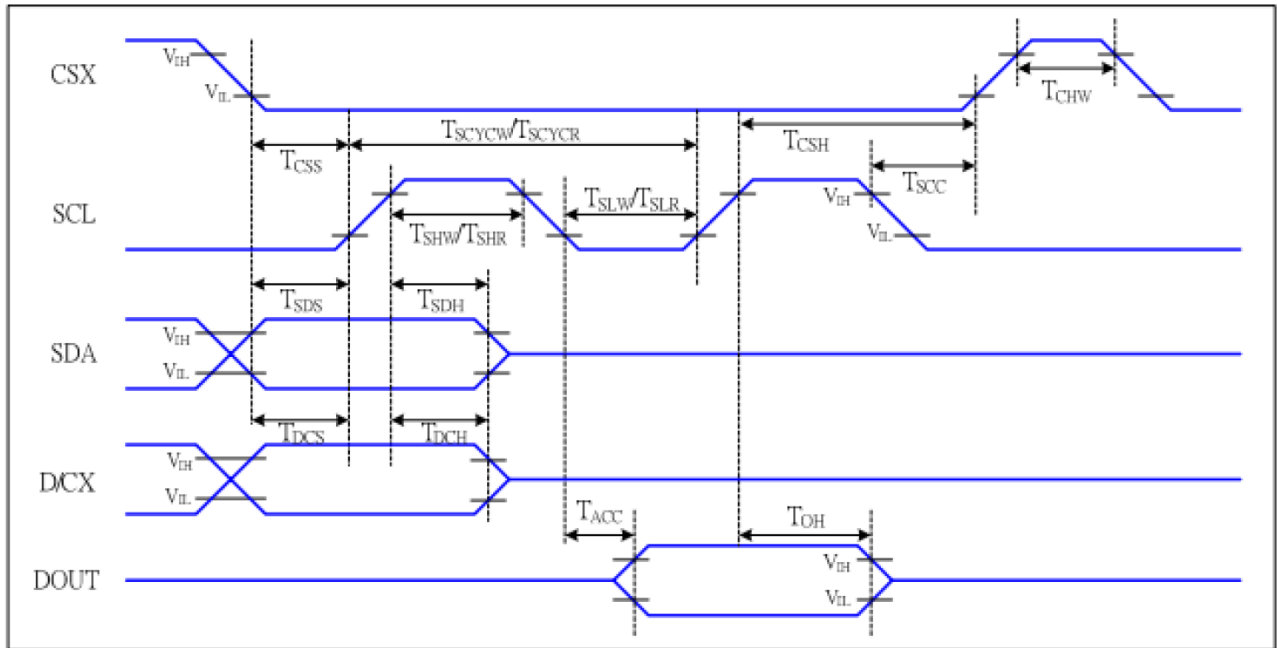
CIRCUIT DIAGRAM



I_F=200 mA; V_F=2.7~3.3V

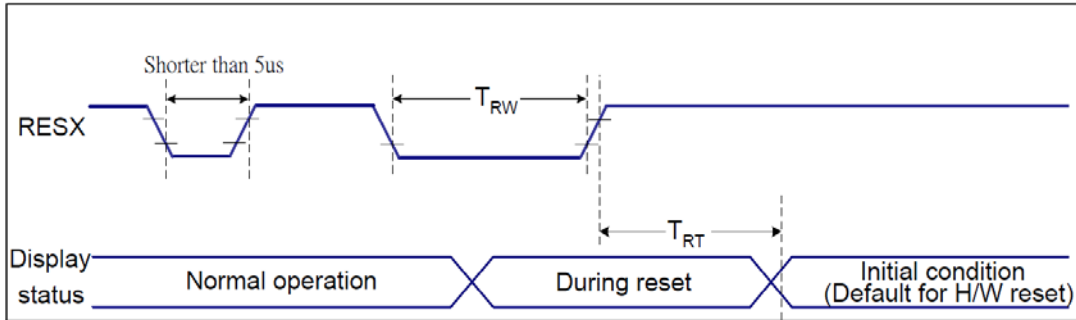
8. Command/AC Timing

8.1 Serial Interface Characteristics (4-line SPI system)



Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	T_{CSS}	Chip select setup time(write)	15	-	ns	
	T_{CSH}	Chip select hold time(write)	15	-	ns	
	T_{CSS}	Chip select setup time(read)	60	-	ns	
	T_{SCC}	Chip select hold time(read)	65	-	ns	
	T_{CHW}	Chip select "H" pulse width	40	-	ns	
SCL	T_{SCYCW}	Serial clock cycle (write)	66	-	ns	-write command& data ram
	T_{SHW}	SCL "H" pulse width (write)	15	-	ns	
	T_{SLW}	SCL "L" pulse width (write)	15	-	ns	
	T_{SCYCR}	Serial clock cycle (read)	150	-	ns	-read command& data ram
	T_{SHR}	SCL "H" pulse width (read)	60	-	ns	
	T_{SLR}	SCL "L" pulse width (read)	60	-	ns	
D/CX	T_{DCS}	D/CX setup time	10	-	ns	
	T_{DCH}	D/CX hold time	10	-	ns	
SDA (DIN)	T_{SDS}	Data setup time	10	-	ns	
	T_{SDH}	Data hold time	10	-	ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF For minimum CL=8pF
	T_{OH}	Output disable time	15	50	ns	

8.2 Reset Timing



VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25°C

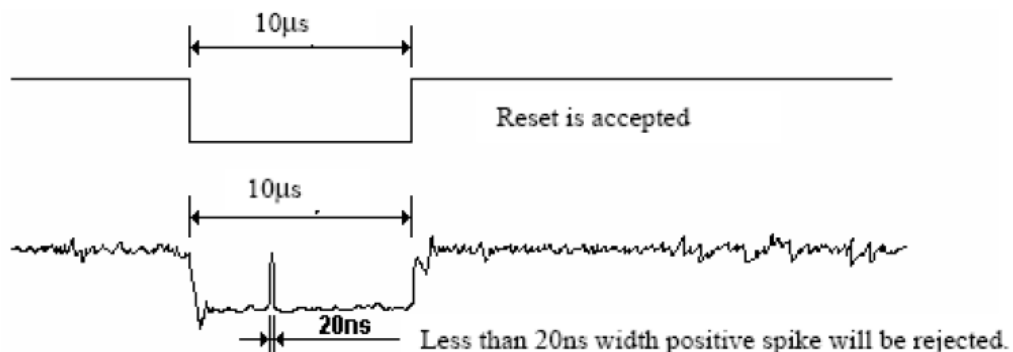
Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
			120 (Note 1, 6, 7)	ms	

Notes:

- The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.
- Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

- During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition for Hardware Reset.
- Spike Rejection also applies during a valid reset pulse as shown below:



- When Reset applied during Sleep In Mode.
- When Reset applied during Sleep Out Mode.
- It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

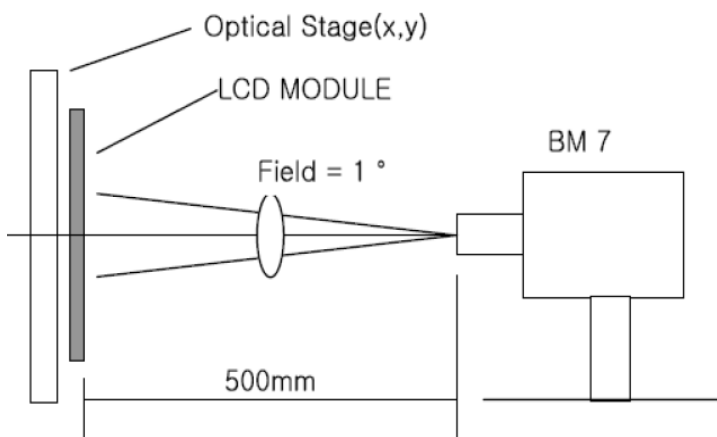
9. Optical Specification

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark		
Contrast Ratio	CR	$\theta=0^\circ$	1000	1200	-		Note1 Note2		
Response Time	TR+TF	25°C	-	30	35	ms	Note1 Note3		
View Angles	ΘT	$CR \geq 10$	-	80	-	Degree	Note 4		
	ΘB		-	80	-				
	ΘL		-	80	-				
	ΘR		-	80	-				
Chromaticity	White	Brightness is on	Typ-0.05	Typ+0.05			Note5, Note1		
								x	0.256
	y							0.317	
	Red							x	0.643
								y	0.339
	Green							x	0.302
								y	0.605
	Blue							x	0.135
y		0.088							
Luminance	L		-	750	-	cd/m ²	Note1 Note6		
Uniformity (White)	U		80	-	-	%	Note1 Note7		

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

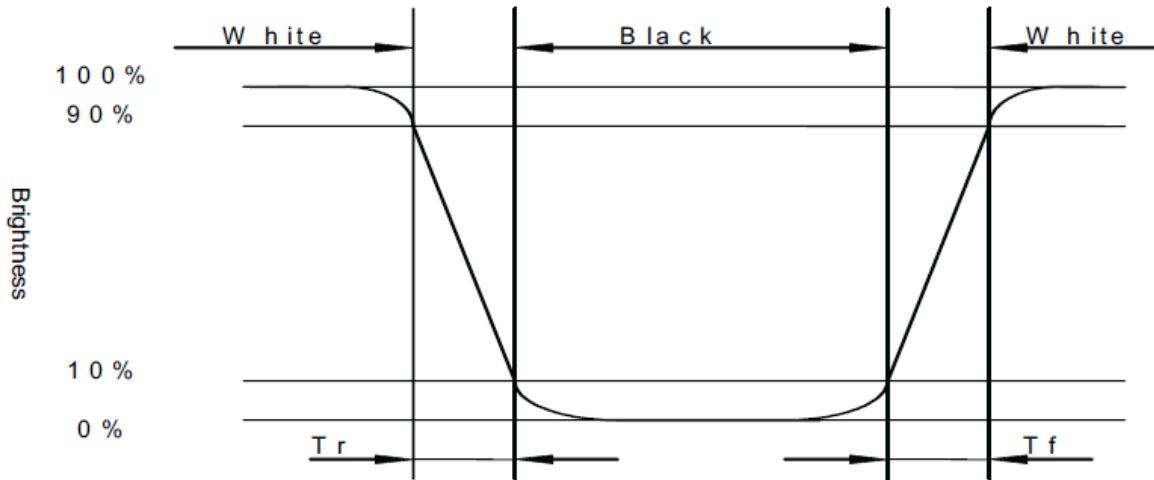


Note 2: Contrast ratio is defined as follow:

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

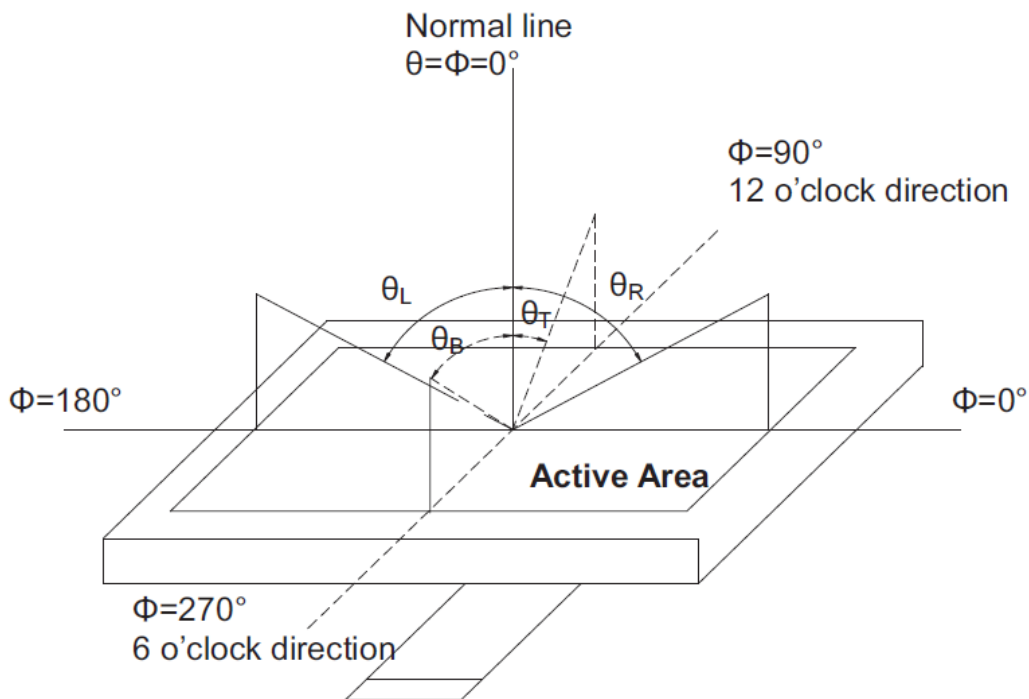
Note 3: Response time is defined as follow:

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



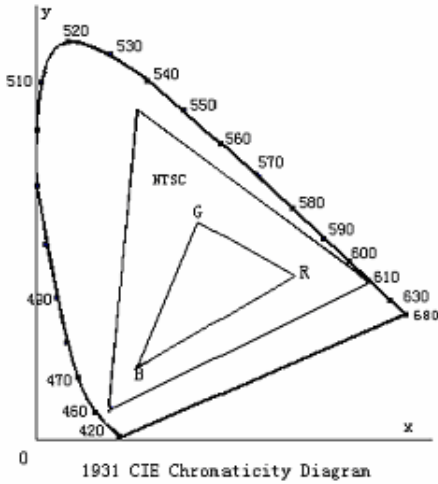
Note 4: Viewing angle range is defined as follow:

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.

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

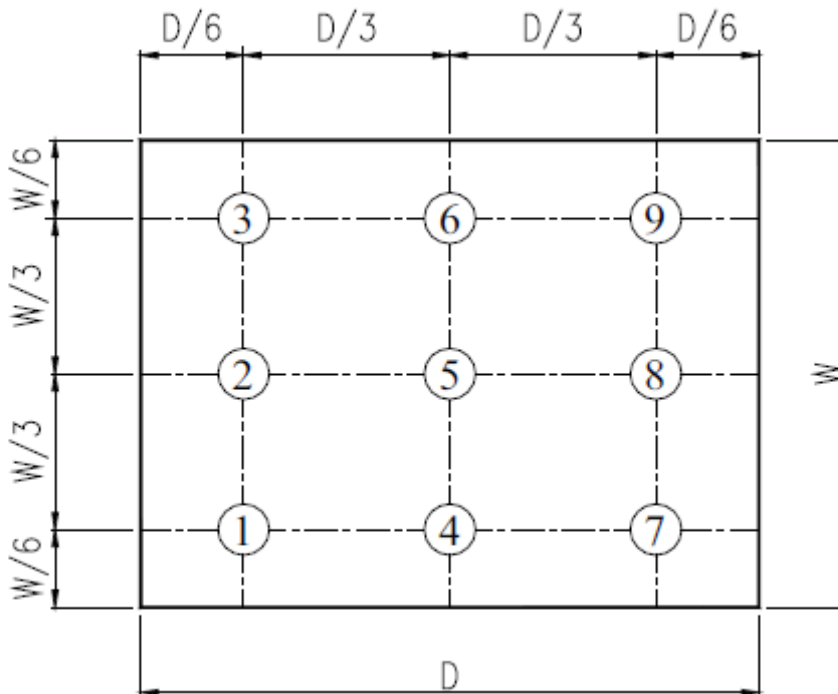


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ta= 70°C, 96hrs	Per table in below
2	Low Temp Operation	Ta= -20°C, 96hrs	Per table in below
3	High Temp Storage	Ts= 80°C, 96hrs	Per table in below
4	Low Temp Storage	Ts= -30°C, 96hrs	Per table in below
5	High Temp & High Humidity Storage	Ts= +60°C, 90% RH 96hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 10 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.

11.4 Storage

- A. Store the products in a dark place at $+25^{\circ}\text{C}\pm 10^{\circ}\text{C}$ 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

- A. 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.
- B. In order to make the display assembly stable and firm, DLC recommends to design some supporting at the display backside, especially for the display with tape-attached touch panel, such supporting is important and essential, or else, the display may drop-off from front after some period of time.
- C. Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.

