



TFT LCD Module

Product Specification

DT010ATFT
1.0" (80RGB x 160 DOTS) IPS TFT Module

June 30, 2020

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Displaytech

Email: sales@displaytech.com.hk

Website: <http://www.displaytech.com.hk>

Revision Record

REV	CHANGES	DATE
1.0	First release	Jun 30, 2020

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1. Scope

This data sheet is to introduce the specification of DT010ATFT active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The 0.96" display area contains 80 (RGB) x 160 pixels.

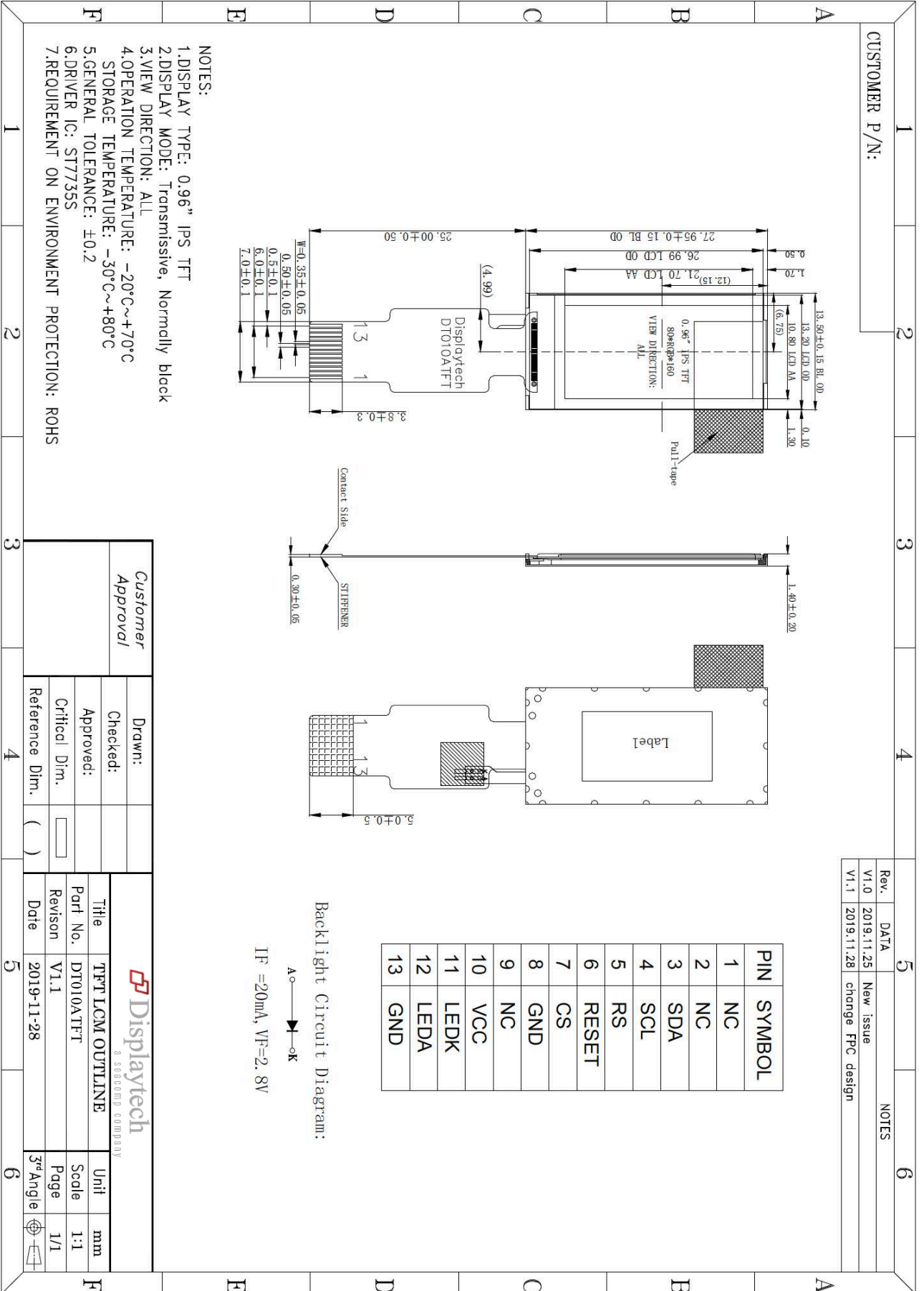
2. Application

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

3. General Information

Item	Contents	Unit
Size	0.96	Inch
Resolution	80(RGB)*160	/
Interface	4 Line SPI	/
Technology type	IPS	/
Pixel Pitch	0.135 x 0.135	mm
Pixel Configuration	R.G.B.Vertical Stripe	
Outline Dimension(W*H*D)	13.50 x 27.95 x 1.40	mm
Active Area	10.80 x 21.70	mm
Display Mode	Transmissive, Normally black	/
Driver IC	ST7735S	
Viewing Direction	ALL	
Backlight Type	LED	/

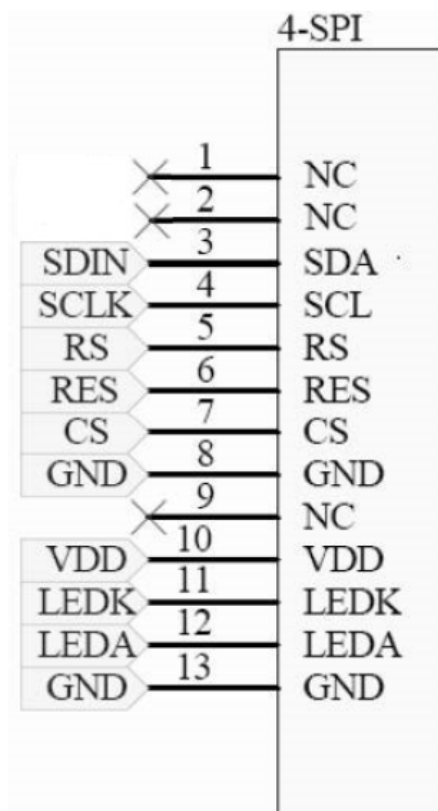
4. LCM Outline Drawing



5. Interface signals

No.	Symbol	Description
1	NC	No connection
2	NC	No connection
3	SDA	SPI interface input/output pin. The data is latched on the rising edge of the SCL signal
4	SCL	This pin is used to be serial interface clock
5	RS	Display Data or command selection pin in 4-Line serial interface
6	RESET	This signal will reset the device and it must be applied to properly initialize the chip. Signal is active low
7	CS	Chip selection pin, Low enable, High disable
8	GND	Power Ground
9	NC	Not Connect
10	VCC	Power Supply
11	LEDK	LED Cathode
12	LEDA	LED Anode
13	GND	Power Ground

Note:



6. Absolute maximum Ratings

6.1 Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VDD	-0.3	4.6	V	
	VDDIO	-0.3	4.6	V	
	VIN	-0.3	VDD+0.3	V	

6.2 Environment Conditions

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

6.3 LED Backlight Absolute max. ratings

Item	Symbol	MIN	MAX	Unit	Remark
LED Forward Current	ILED	--	25	mA	One LED

7. Electrical Specifications

7.1 Electrical characteristics

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply voltage for logic	VDD	2.5	2.8	3.3	V	
Interface operation voltage	VDDIO	1.65	1.8	3.3	V	
Supply current for VDD	IDD	-	2	3	mA	
Gate driver voltage	VGH	10	-	15	V	
	VGL	-13	-	-7.5	V	
Sleep in mode VDD	I _{dd}	-	15	30	uA	
Sleep in mode VDDIO	I _{ddio}	-	5	10	uA	

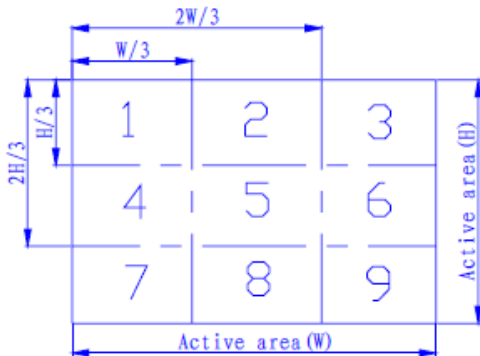
Note1: Test condition is:

a: Center point on active area

b: Best contrast

Note2: Uniform measure condition:

- a: Measure 9 point, Measure location is show below:
- b: $Uniform = (Min\ brightness / Max.\ brightness) \times 100\%$
- c: Best contrast

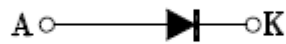


7.2 LED Backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	-	20	-	mA	If=45 mA
Forward Voltage	VF	-	2.8	-	V	

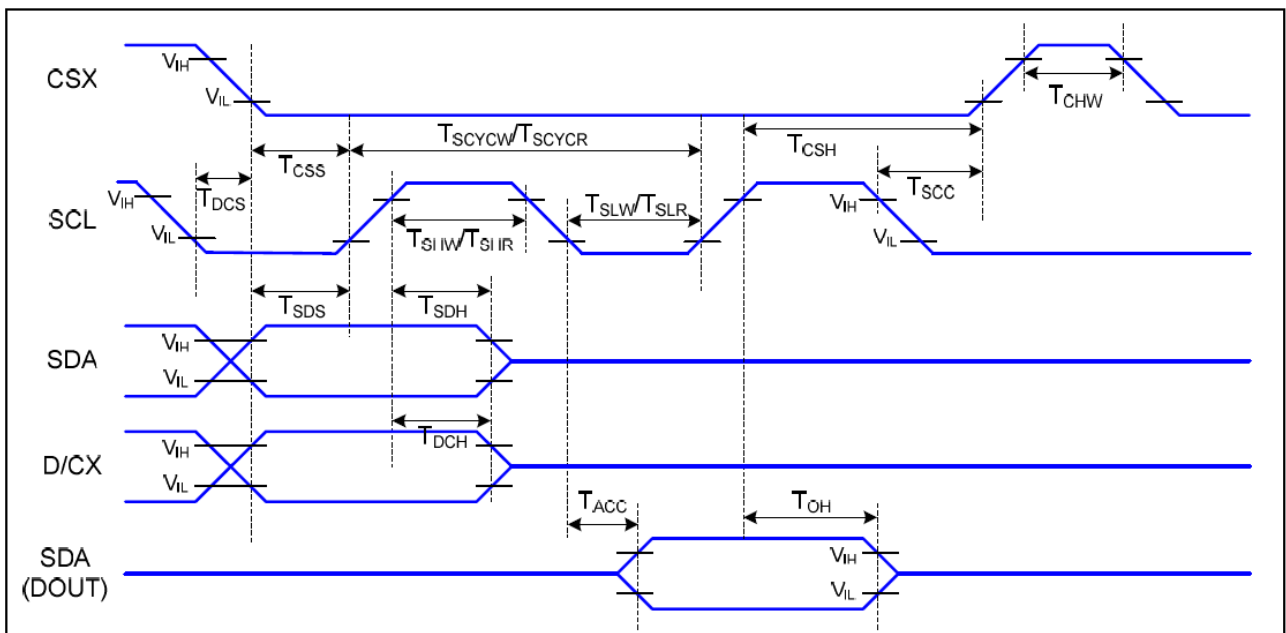
Backlight Circuit Diagram:



IF =20mA, VF=2.8V

8. Command/AC Timing

Serial Interface Characteristics (4-line serial)



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)	30		ns	
	T _{SLW}	SCL "L" pulse width (write)	30		ns	
	T _{SCYCR}	Serial clock cycle (read)	150		ns	-Read command & data ram
	T _{SHR}	SCL "L" pulse width (read)	60		ns	
	T _{SLR}	SCL "L" pulse width (read)	60		ns	
D/CX	T _{D_{CS}}	D/CX setup time	-	0	ns	
	T _{D_{CH}}	D/CX hold time	10	-	ns	
SDA (DIN) (DOUT)	T _{SDS}	Data setup time	10		ns	For maximum CL=30pF For minimum CL=8pF
	T _{SDH}	Data hold time	10		ns	
	T _{ACC}	Access time	10	50	ns	
	T _{OH}	Output disable time	-	50	ns	

Note 1: VDDI=1.65 to 3.3V, VDD=2.6 to 3.3V, AGND=DGND=0V, Ta=25 °C

Note 2: The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

9. Optical Specification

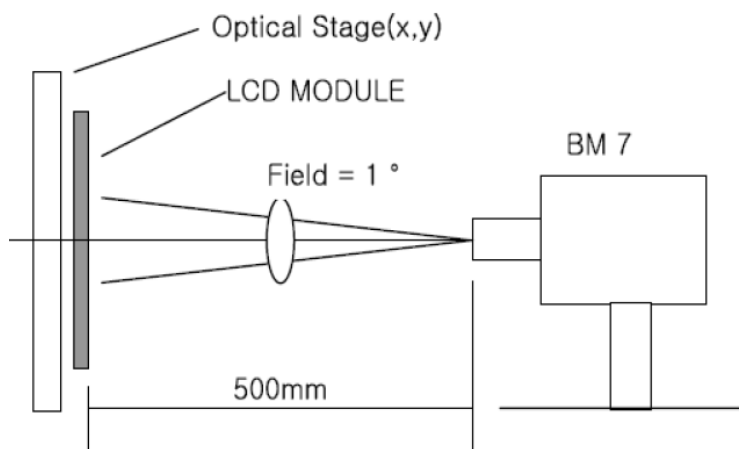
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	-	800	-		Note1 Note2
Response Time	Ton+Toff	25°C	-	30	40	ms	Note1 Note3
View Angles	ΘT	CR ≥ 10	-	80	-	Degree	Note4
	ΘB		-	80	-		
	ΘL		-	80	-		
	ΘR		-	80	-		
Chromaticity	White	Brightness is on	X	0.304	0.306	0.308	Note5 Note1
			Y	0.325	0.327	0.329	
	Red		X	0.608	0.610	0.612	
			Y	0.331	0.333	0.335	
	Green		X	0.279	0.281	0.283	
			Y	0.531	0.533	0.535	
	Blue		X	0.144	0.146	0.148	
			Y	0.136	0.138	0.140	
NTSC	S			TBD		%	Note5
LUMINANCE	L		-	300	-	Cd/m ²	Note1 Note6
Uniformity	U		80	-	-	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

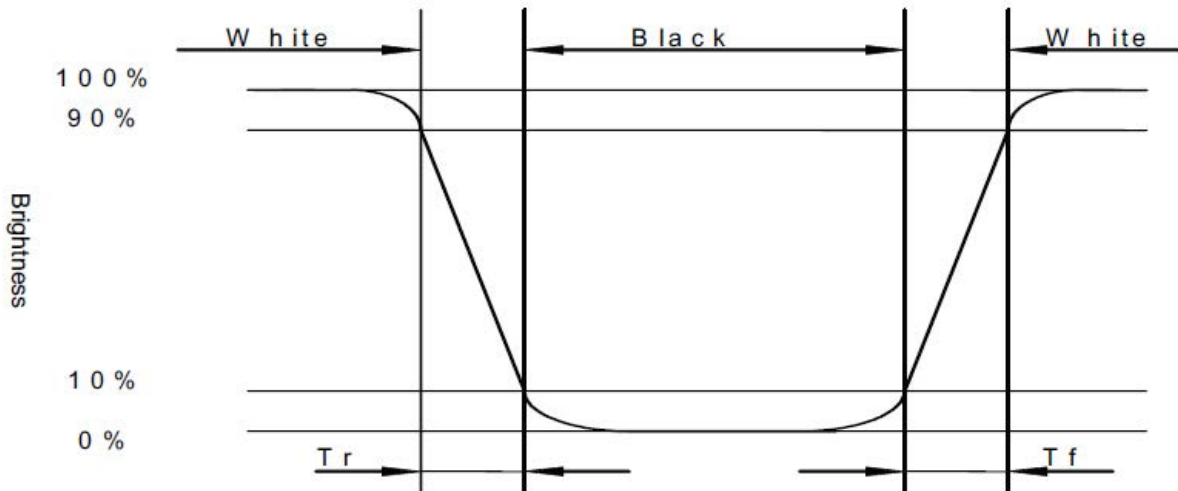


Note 2: Contrast ratio is defined as follow:

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

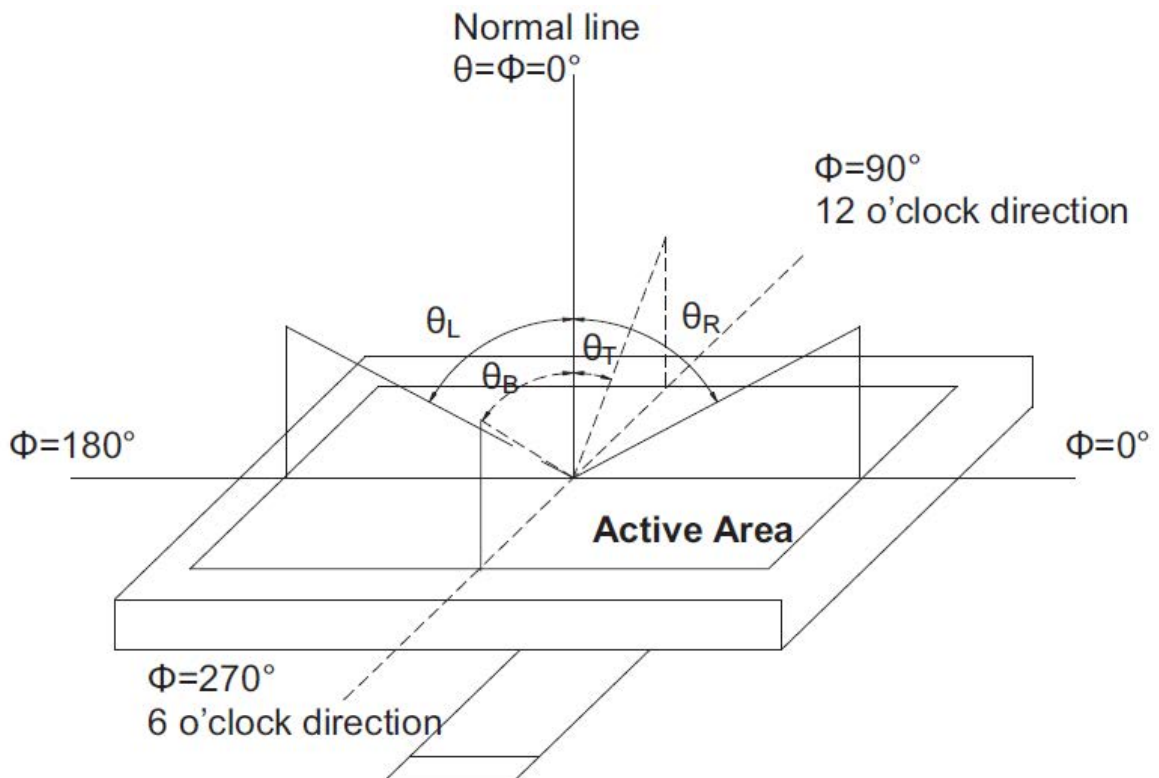
Note 3: Response time is defined as follow:

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).



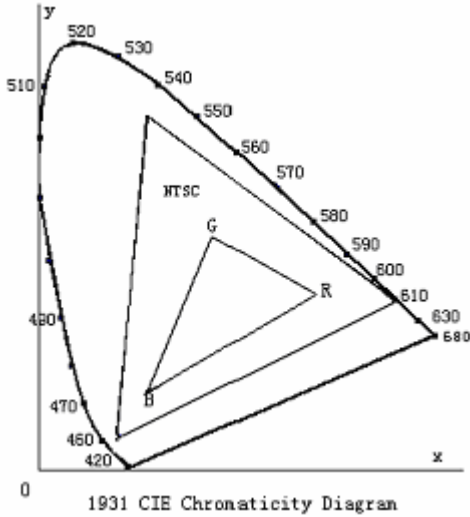
Note 4: Viewing angle range is defined as follow:

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.

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

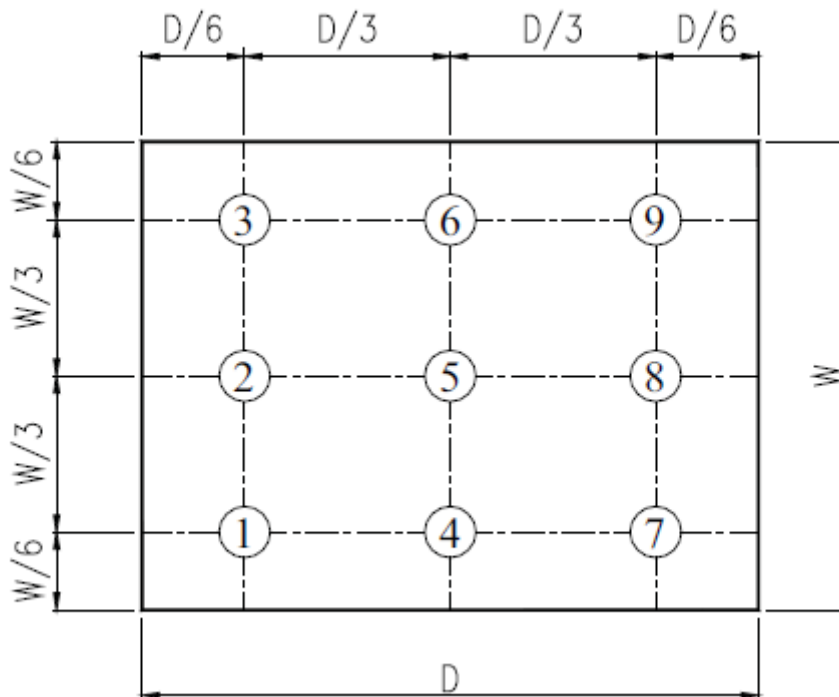


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No.	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 96hrs	Per table in below
2	Low Temp Operation	Ta=-20°C, 96hrs	Per table in below
3	High Temp Storage	Ta=+80°C, 96hrs	Per table in below
4	Low Temp Storage	Ta=-30°C, 96hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+40°C, 90% RH 96 hours	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, Displaytech Ltd. 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.

