TFT LCD Module

Product Specification

DT010TFT

1.0" (80(RGB) x 160 PIXELS) TFT Module

June 1, 2016

Revision Record

REV	CHANGES	DATE
0.0 (Ref. 1.0 20150707)	First release	Jun 1, 2016
	-	
	-	

Table of Content

1. Scope

This data sheet is to introduce the specification of DT010TFT active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 1.0" display area contains 80 (RGB) x 160 pixels.

2. Application

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

3. General Information

Item	Contents	Unit
Size	1.0	inch
Resolution	80(RGB) x 160	/
Interface	4-wire-SPI	/
Technology Type	TFT	/
Pixel Configuration	R.G.B. Stripe	/
Pixel Pitch	0.144 x 0.126	mm
Outline Dimension (W x H x D)	16.00 x 26.80 x 2.0	mm
Active Area	11.52 x 20.16	mm
Display Mode	Normally white, Transmissive	/
Backlight Type	LED	/

4. Outline Drawing

NOTES:
1.DISPLAY TYPE: TFT
2.DISPLAY MODULE: Transmissive ,Normally White
3.OPERATIN TEMP: -20° C---+70° C
4.STORAGE TEMP: -30° C---+80° C
5.Backlight: LED
6. RoHS Compliant

PIN	FUCTION
PIN	SYMBOL
1	GND
2	LED-A
3	LED-K1
4	LED-K2
5	GND
6	RESET
7	D/C
8	SDA
9	SCK
10	VDD
11	VDD
12	CS
13	GND

DRAWN	BY:	
CHECKED	BY:	
APPROVED	BY:	
CONFIRMED	BY:	
TITLE:	DT010TFT	
DWG NO:		
DWG NAME:		
SCALE:		
UNIT: mm	SHEET NO:	OF
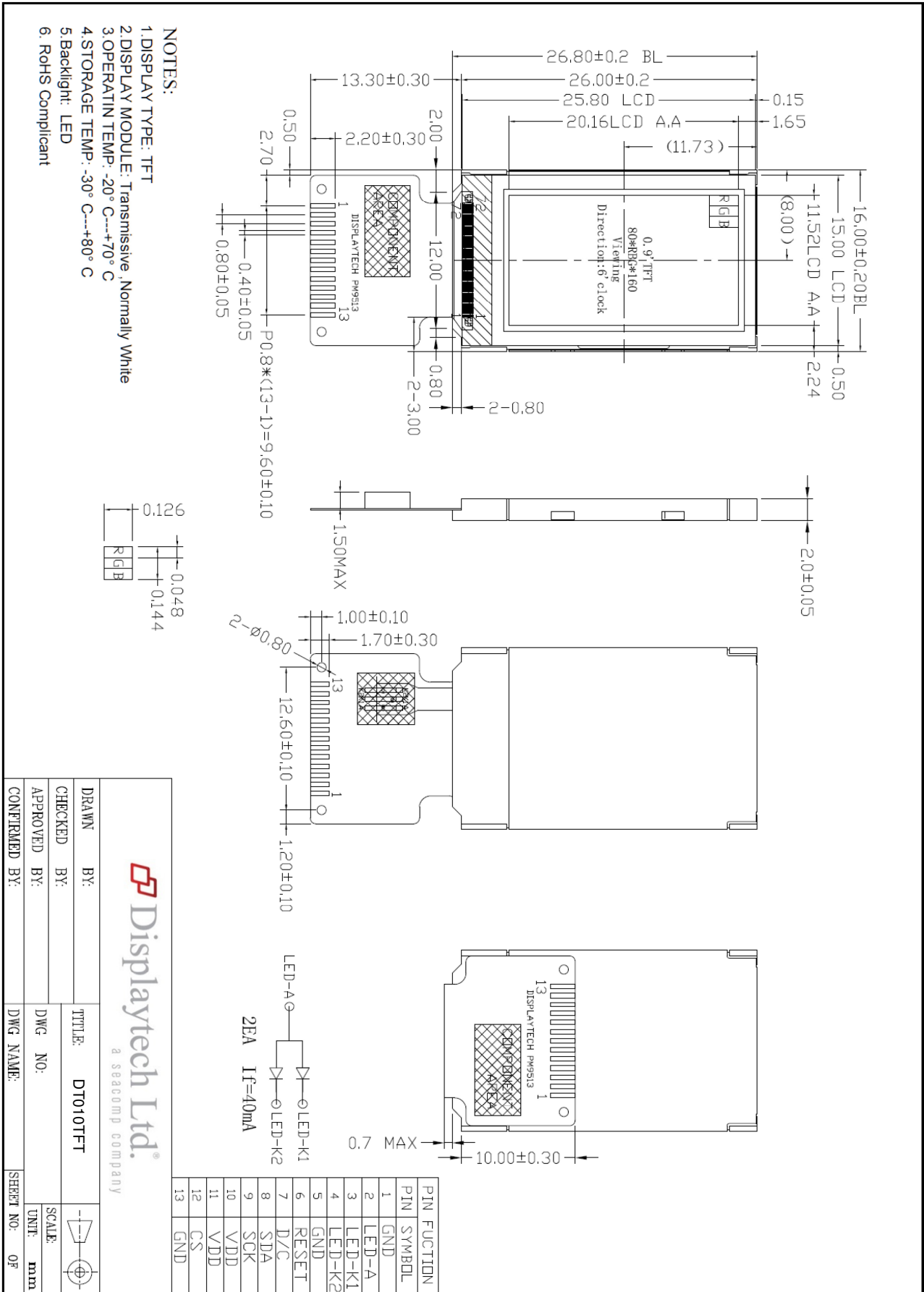
5. Interface Signals

No	Symbol	I/O	Description	Remark
1	GND	P	Ground	
2	LEDA	P	LED backlight (Anode)	
3	LEDK1	P	LED backlight (Cathode)	
4	LEDK2	P	LED backlight (Cathode)	
5	GND	P	Ground	
6	RESET	I	Reset the display	
7	D/C	I	Command / Data select	
8	SDA	I	Serial input / output data bus	
9	SCK	I	Serial clock	
10	VCC	P	Power supply	
11	VCC	P	Power supply	
12	CS	I	Chip select pin	
13	GND	P	Ground	

6. Absolute Maximum Ratings

6.1 Electrical absolute maximum ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VCC	-0.3	3.3	V	Note 1, 2
Logic Signal Input / Output Voltage	VIOVCC	-0.3	VCC+0.5	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.
2. VCC > VSS must be maintained.

6.2 Environment conditions

Parameter	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		VCC	2.6	2.8	3.0	V	Ta=25°C
Input Voltage	H	VIH	0.8VCC	-	VCC	V	VCC=2.8V
	L	VIL	0	-	0.2VCC	V	
Current Consumption		ICC1	-	1.5	2.5	mA	Normal mode
		ICC2	-	0.03	0.1	mA	Sleep mode

Note 1: Tested in 1$\times$1 chessboard pattern.

7.2 LED backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward voltage	VF	-	3.0	-	V	If=20x2mA
LED life time	-	-	30,000	-	Hr	
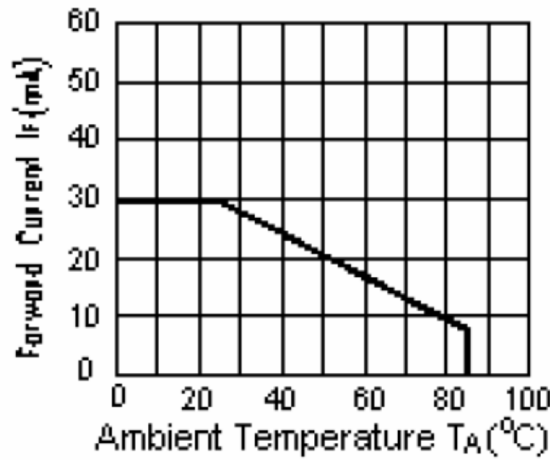
7.3 Block Diagram
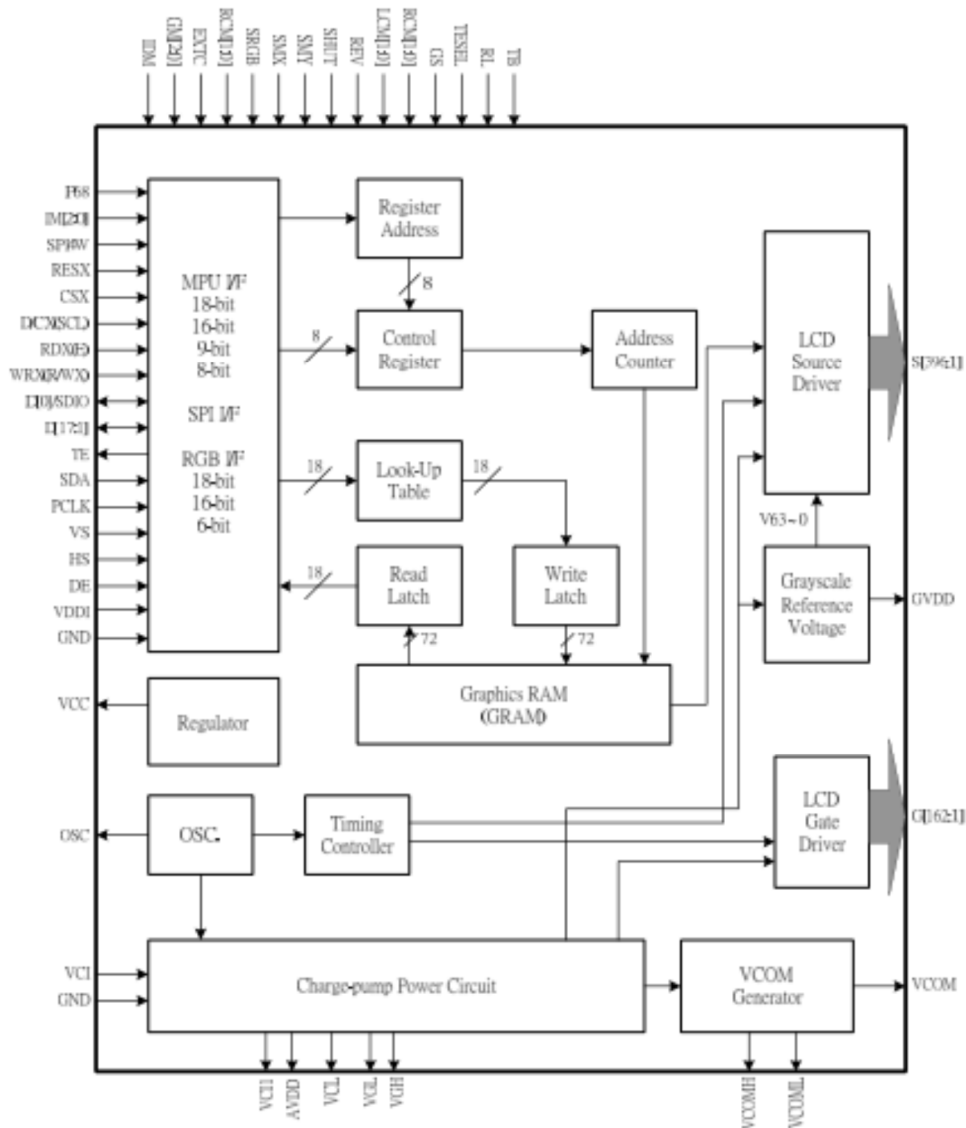
8. Command / AC Timing

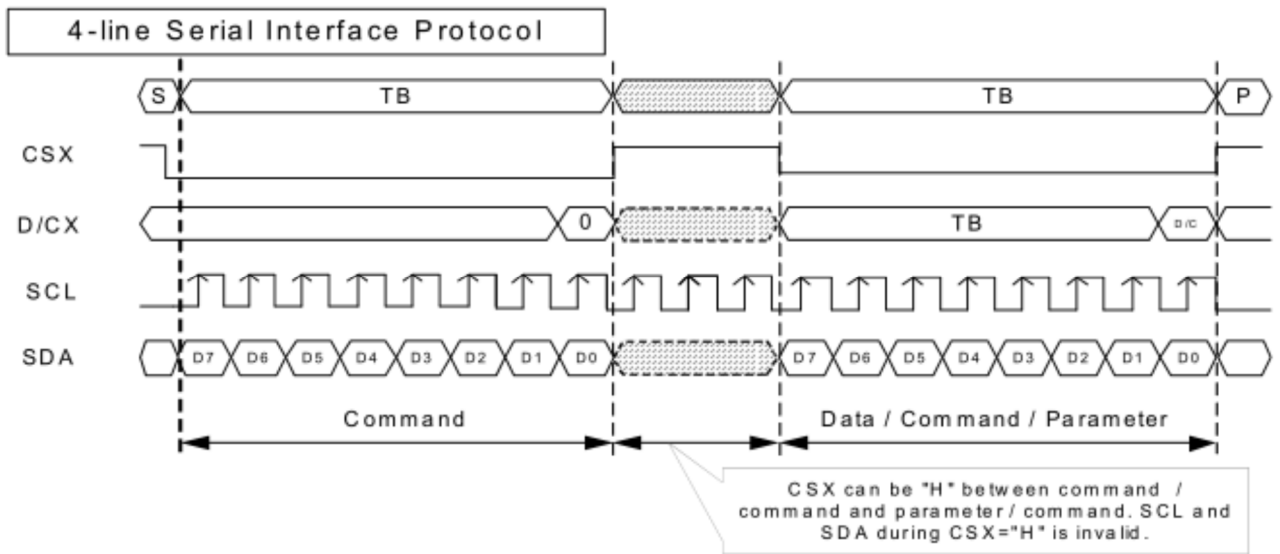## 8.1 SPI write/read to register or GRAM

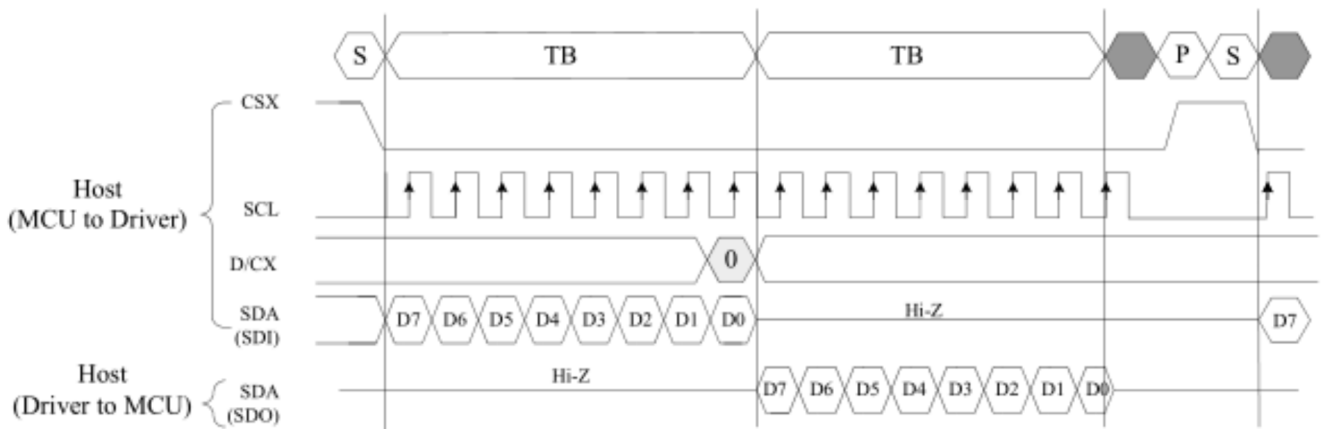Figure: 4-pins Serial Protocol for writing register or GRAM

Figure: 4-pins Serial Protocol (for DAH/DBH/DCH/0AH/0BH/0CH/0DH/0EH/0FH command:8-bit read)
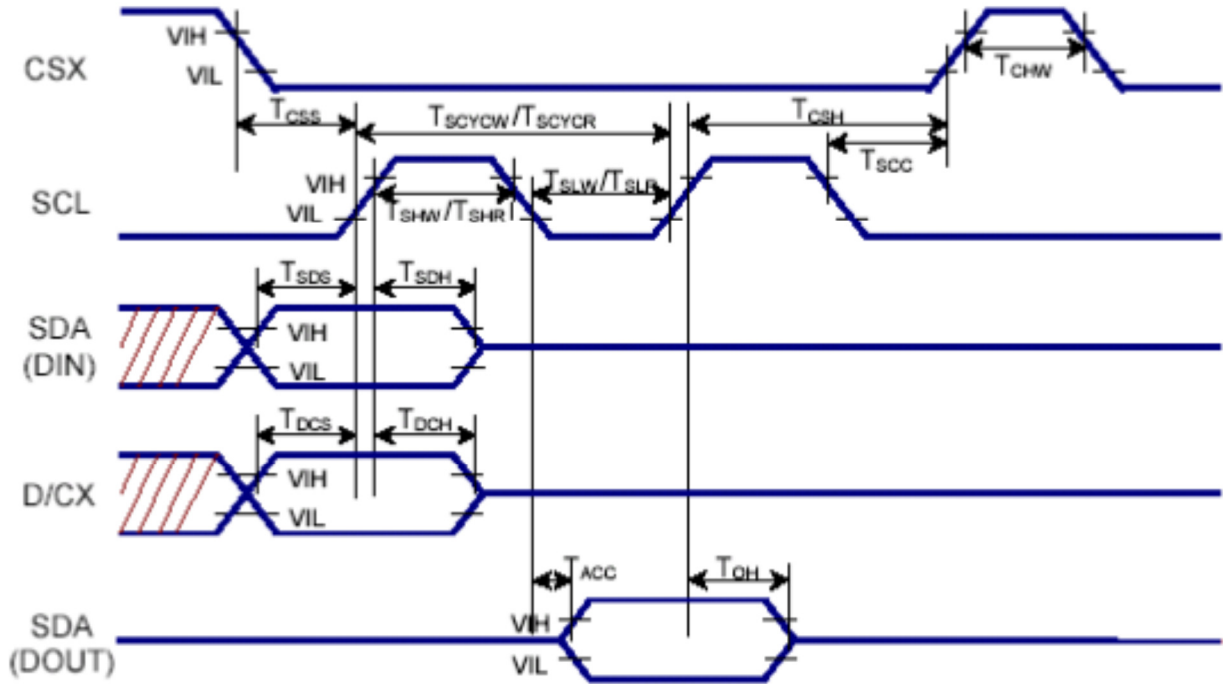
8.2 i80-System Interface Timing Characteristics

Table: 4 pin Serial Interface Characteristics

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	TCSS	Chip select setup time	10		ns	
	TCSH	Chip select hold time	30		ns	
	TCHW	Chip select "H" pulse width	30		ns	
SCL	TSCYCW	Serial clock cycle(Write)	66		ns	
	TSHW	S"L""H" pulse width(Write)	15		ns	
	TSLW	S"L""L" pulse width(Write)	15		ns	
	TSCYCR	Serial clock cycle(Read)	150		ns	
	TSHR	S"L""H" pulse width(Read)	60		ns	
	TSLR	S"L""L" pulse width(Read)	60		ns	
D/CX	TDCS	D/CX setup time	5		ns	
	TDCH	D/CX hold time	5		ns	
SDA(DIN) (DOUT)	TSDS	Data setup time	5		ns	
	TSDH	Data hold time	5		ns	
	TACC	Access time	5	50	ns	For maximum CL = 30pF
	TOH	Output disable time	10		ns	For minimum CL = 8pF

9. Optical Specification

Ta=25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Remark
Contrast ratio		CR	θ=0°	300	500	-		Note 1, 2
Response time		Tr	25°C	-	10	-	ms	Note 1, 3
		Tf		-	10	-		
View angles		ΘT	CR≧10	-	55	-	Degree	Note 4
		ΘB		-	65	-		
		ΘL		-	65	-		
		ΘR		-	65	-		
Chromaticity	White	x	Brightness is on	-	0.28	-		Note 1, 5
		y		-	0.33	-		
	Red	x		-	0.51	-		
		y		-	0.34	-		
	Green	x		-	0.31	-		
		y		-	0.56	-		
	Blue	x		-	0.15	-		
		y		-	0.14	-		
NTSC Ratio		S		50	60		%	Note 1, 5
Luminance		L		-	150	-	cd/m²	Note 1, 6
Uniformity		U		80	-	-	%	Note 1, 7

Note 1: Definition of optical measurement system.

Temperature = 25°C (±3°C)

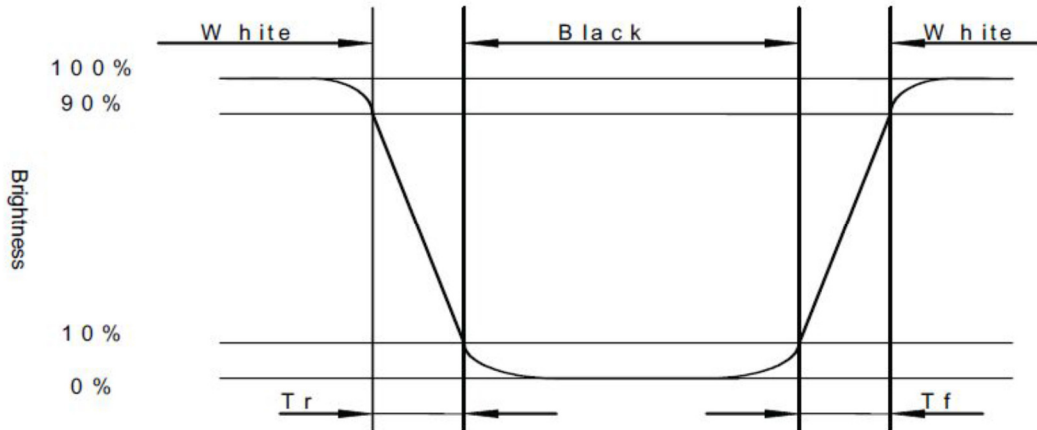LED back-light: ON, Environment brightness < 150 lx
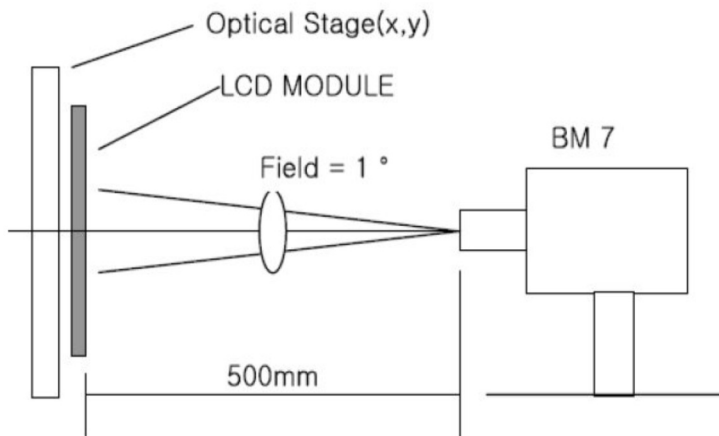
Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$
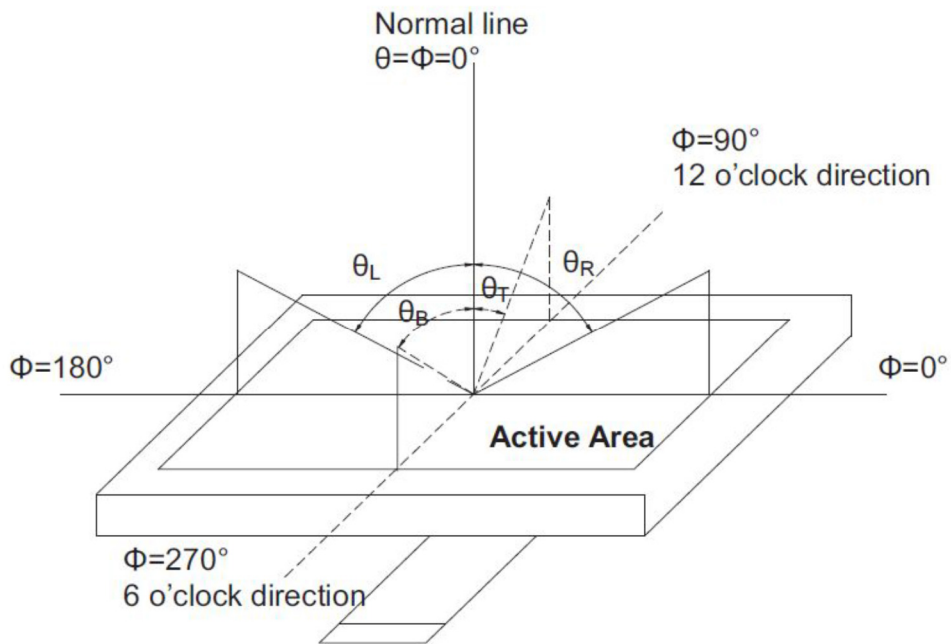
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise time, Tr) and from white to black (Decay Time, Tf).
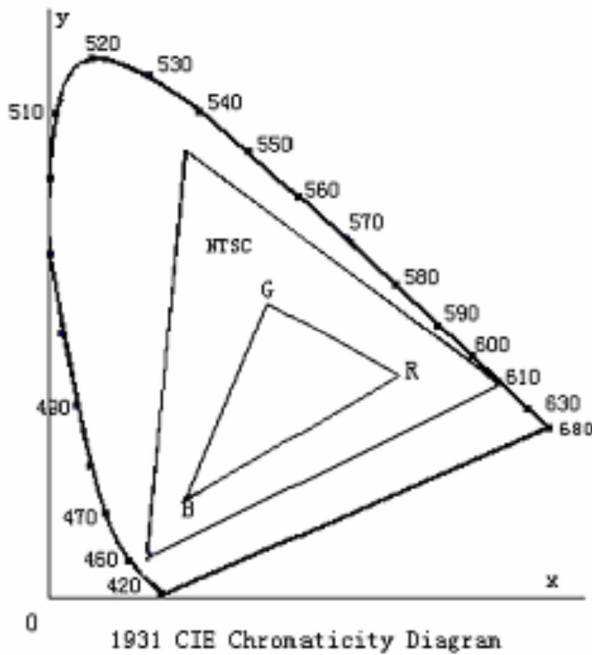
Note 4: Viewing angle range is defined as follow:

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.

1931 CIE Chromaticity Diagram

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

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.

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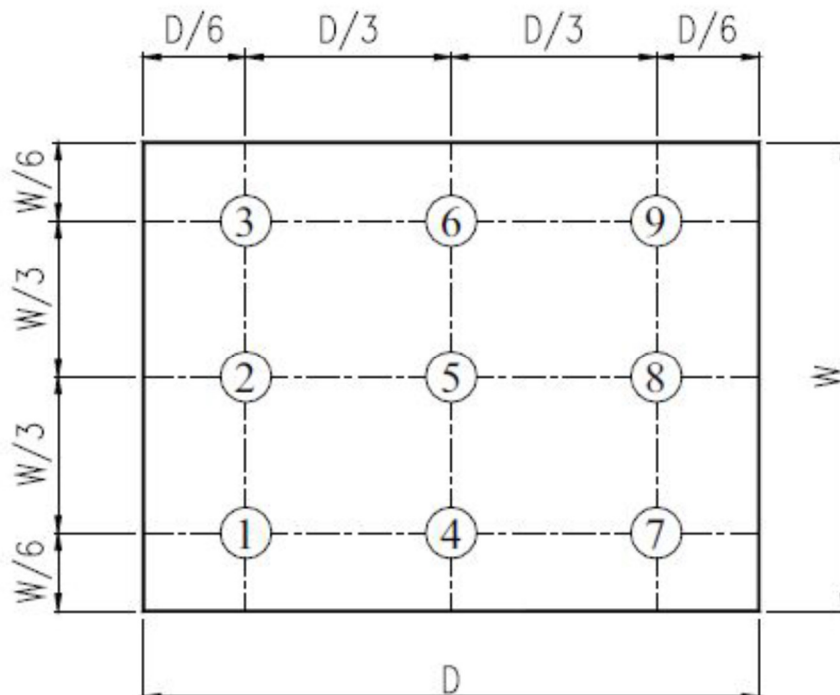

Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment Criteria
1	High Temp Operation	Ta=+70°C, 120hrs	Per table below
2	Low Temp Operation	Ta=-20°C, 120hrs	Per table below
3	High Temp Storage	Ta=+80°C, 120hrs	Per table below
4	Low Temp Storage	Ta=-30°C, 120hrs	Per table below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH, 120hrs	Per table below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-20℃ 30 min~+70℃ 30 min, Change time:5min, 10 Cycles	Per table below
7	ESD (Operation)	C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table 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 below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table below
10	Package Drop Test	Height: 80cm, 1 corner, 3 edges, 6 surfaces	Per table 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°C±10°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
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.