



## ASI-T-17711A1SPN/D

Item	Contents	Unit
Size	1.77	inch
Resolution	160 (RGB) x 128	/
Interface	SPI	/
Technology type	a-Si TFT	/
Pixel pitch	0.2205 x 0.2165	mm
Pixel Configuration	RGB stripes	
Outline Dimension (W x H x D)	40.77 x 36.20 x 2.20	mm
Active Area	35.28 x 27.71	mm
Display Mode	Transflective, Normally white	/
Viewing Direction	10:50 o'clock	/
Backlight Type	LED	/
Driver IC	ST7789VI	/
Weight	TBD	g



## Record of Revision

Date	Revision No.	Summary
2021-07-01	1.0	Rev 1.0 was issued



## 1. Scope

This data sheet is to introduce the specification of ASI-T-17711A1SPN/D active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The 1.77" display area contains 160(RGB) x 128 pixels.

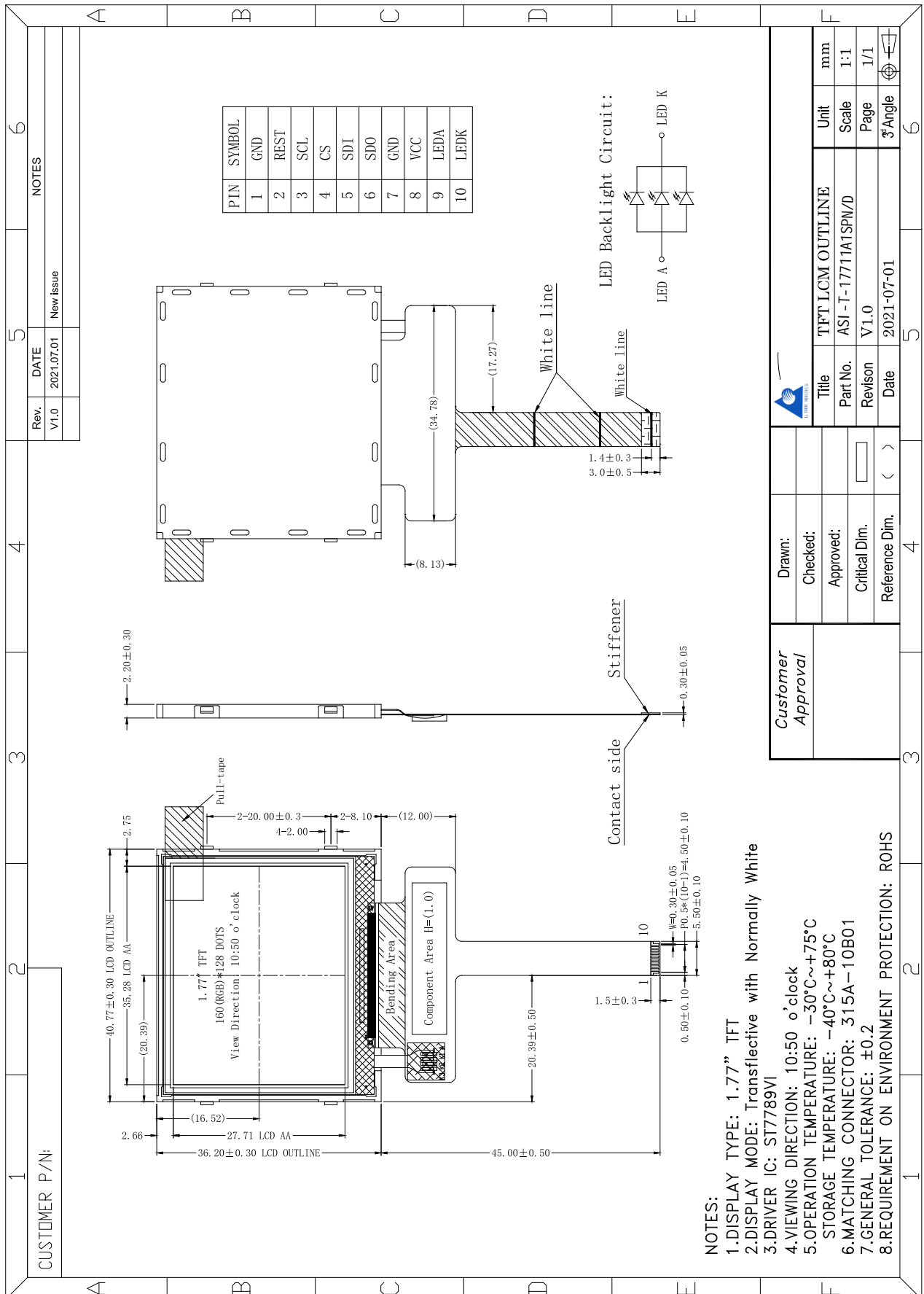
## 2. Application

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

## 3. General Information

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### 4. Outline Drawing



## 5. Interface signals

Pin No	Symbol	Function
1	GND	Ground
2	REST	Reset signal (low active)
3	SCL	Serial interface clock input pin
4	CS	Chip selection pin, low enable
5	SDI	Serial interface data input pin
6	SDO	Serial interface data output pin
7	GND	Ground
8	VCC	Power supply voltage
9	LEDA	Power supply for LED (Anode)
10	LEDK	Power supply for LED (Cathode)

Note:

IM3	IM2	IM1	IM0	MPU Interface Mode	Data pin
1	1	0	1	3-line 9bit serial I/F II	SDA: in /SDO: out

Table: Select the interface mode

## 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	

### 6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-30	75	°C	
Storage Temperature	TSTG	-40	80	°C	

## 7. Electrical Specifications

### 7.1 Electrical characteristics

Ta = 25 °C, GND=0V

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Voltage	VCC	3.2	3.3	3.4	V	
Input Signal Voltage	VIL	0	--	0.3*VCC	V	
	VIH	0.7*VCC	--	VCC	V	

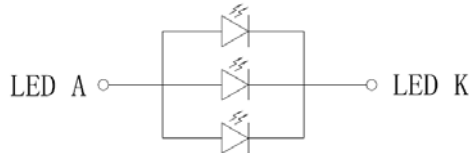
Output Signal Voltage	VOL	0	--	0.2*VCC	V	
	VOH	0.8*VCC	--	VCC	V	

## 7.2 LED Backlight

Ta=25°C

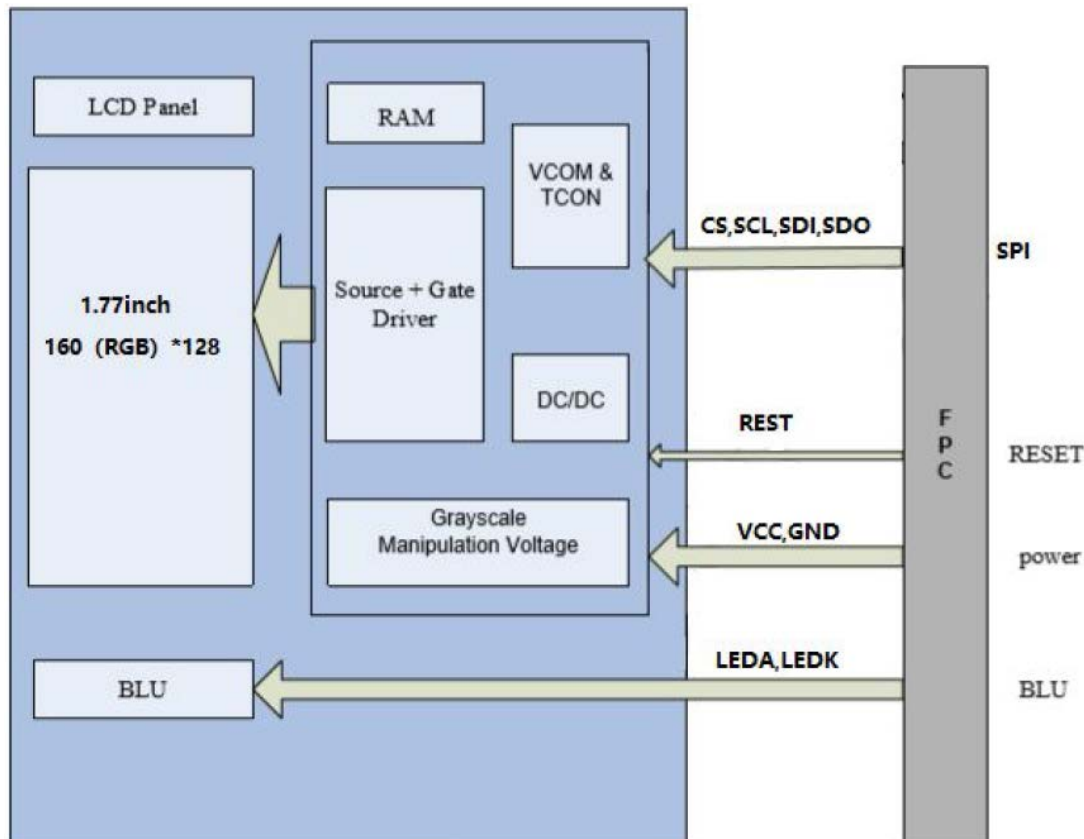
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	--	45	--	mA	
Forward Voltage	VF	2.8	3.1	3.3	V	
Backlight power consumption	WBL	--	139.5	--	mW	
LED Life time	--	--	30,000	--	Hrs	Note 1

LED Backlight Circuit:



Note 1: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =45mA. The LED lifetime could be decreased if operating IL is larger than 45mA.

## 7.3 Block Diagram



## 8. Command/AC Timing

### 8.1 Serial Interface Characteristics (3-line serial)

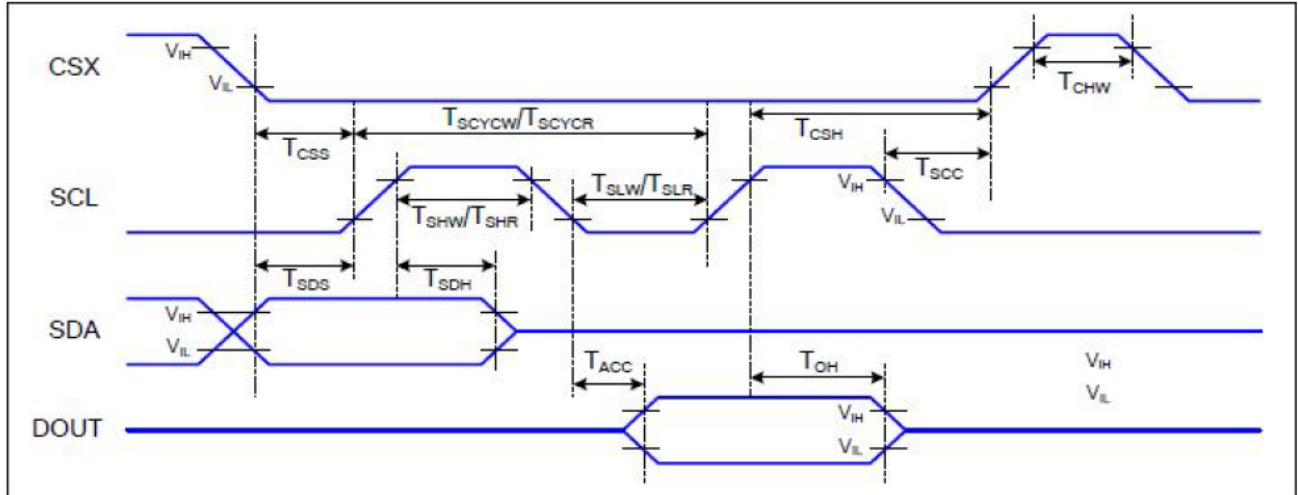


Figure: 3-line serial Interface Timing Characteristics

VDDI=1.65 to 3.6V, VDD=2.4 to 3.6V, AGND=DGND=0V, Ta=25 °C

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T <sub>CSS</sub>	Chip select setup time (write)	15		ns	
	T <sub>CSH</sub>	Chip select hold time (write)	15		ns	
	T <sub>CSS</sub>	Chip select setup time (read)	60		ns	
	T <sub>SCC</sub>	Chip select hold time (read)	65		ns	
	T <sub>CHW</sub>	Chip select "H" pulse width	40		ns	
SCL	T <sub>SCYCW</sub>	Serial clock cycle (Write)	16		ns	
	T <sub>SHW</sub>	SCL "H" pulse width (Write)	7		ns	
	T <sub>SLW</sub>	SCL "L" pulse width (Write)	7		ns	
	T <sub>SCYCR</sub>	Serial clock cycle (Read)	150		ns	
	T <sub>SHR</sub>	SCL "H" pulse width (Read)	60		ns	
	T <sub>SLR</sub>	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T <sub>SDS</sub>	Data setup time	7		ns	
	T <sub>SDH</sub>	Data hold time	7		ns	
DOUT	T <sub>ACC</sub>	Access time	10	50	ns	For maximum CL=30pF
	T <sub>OH</sub>	Output disable time	15	50	ns	For minimum CL=8pF

Table: 3-line serial Interface Characteristics

Note: 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.

## 8.2 Reset Timing

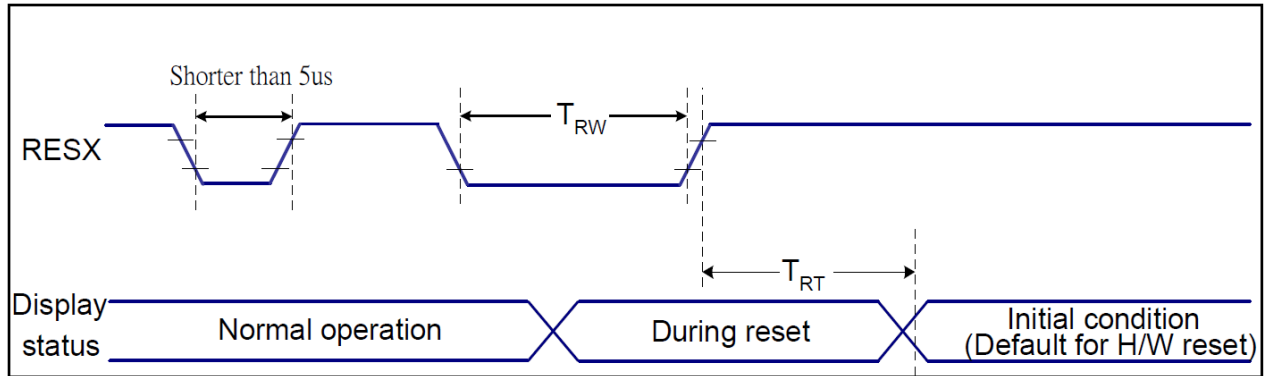


Figure: Reset Timing

VDDI=1.65 to 3.6V, VDD=2.4 to 3.6V, 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	

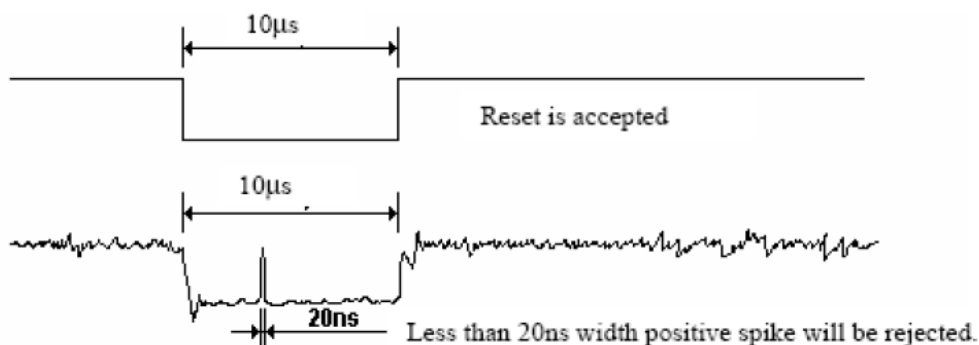
Table: Reset Timing

### 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:







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

## 9. Optical Specification

### 9.1 Driving the Backlight Condition

Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	50	100	--		Note1 Note2
Response Time	Ton/ Toff	25°C	30	40	--	ms	Note1 Note3
View Angles	$\Theta T$	CR $\geq$ 10	30	45	--	Degree	Note 4
	$\Theta B$		45	60	--		
	$\Theta L$		30	40	--		
	$\Theta R$		40	55	--		
Chromaticity	White	Brightness is on	x	0.228	0.278	0.328	Note5, Note1
			y	0.238	0.288	0.338	
	Red		x	0.505	0.555	0.605	
			y	0.259	0.309	0.359	
	Green		x	0.281	0.331	0.381	
			y	0.536	0.586	0.636	
	Blue		x	0.104	0.154	0.204	
			y	0.029	0.079	0.129	
NTSC			--	50	--	%	Note5
Luminance	L		80	110	--	cd/m <sup>2</sup>	Note1 Note6
Uniformity	U		75	80	--	%	Note1 Note7

Test Conditions:

IF=15mA(one channel), VF=3.1V, the ambient temperature is 25°C.

### 9.2 Not Driving the Backlight Condition

Ta=25°C

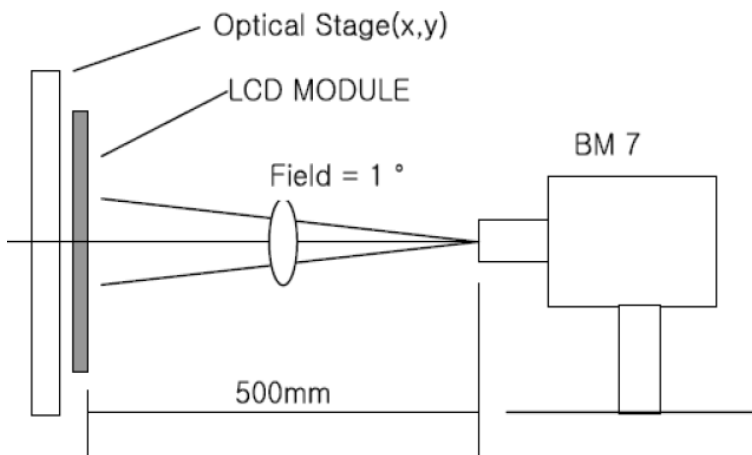
Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	5	8	--		Note1 Note2
Chromaticity	White	Brightness is on	x	0.331	0.327	0.329	Note5, Note1
			y	0.353	0.349	0.352	
	Red		x	0.340	0.390	0.440	
			y	0.282	0.332	0.382	

	Green	x		0.280	0.330	0.380		
		y		0.305	0.405	0.455		
	Blue	x		0.165	0.215	0.265		
		y		0.176	0.226	0.276		
Reflection Ratio				2	5	--	%	Note 1 Not 7

Note 1: Definition of optical measurement system.

Temperature = 25°C (±3°C)

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

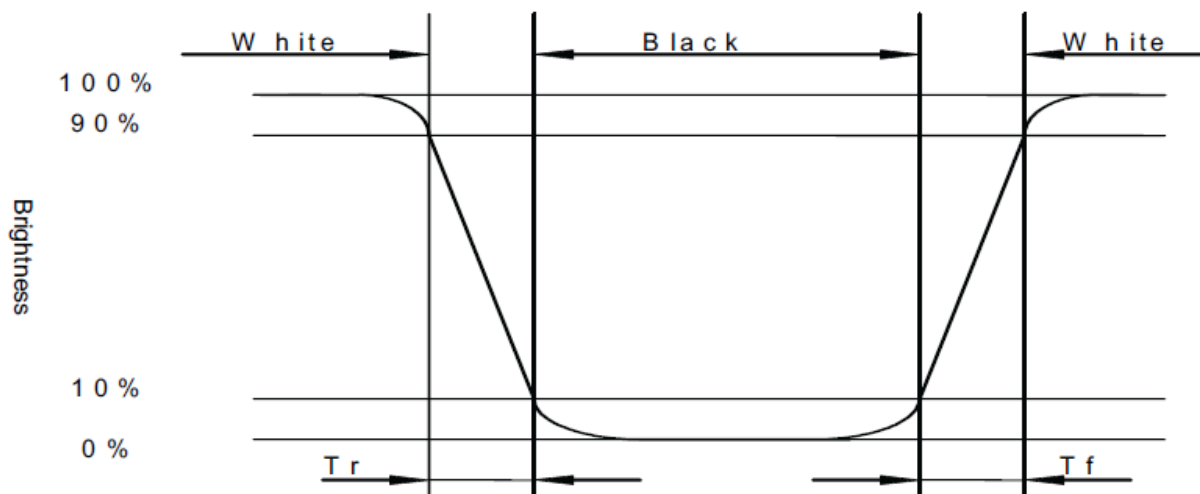


Note 2: Contrast ratio is defined as follow:

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

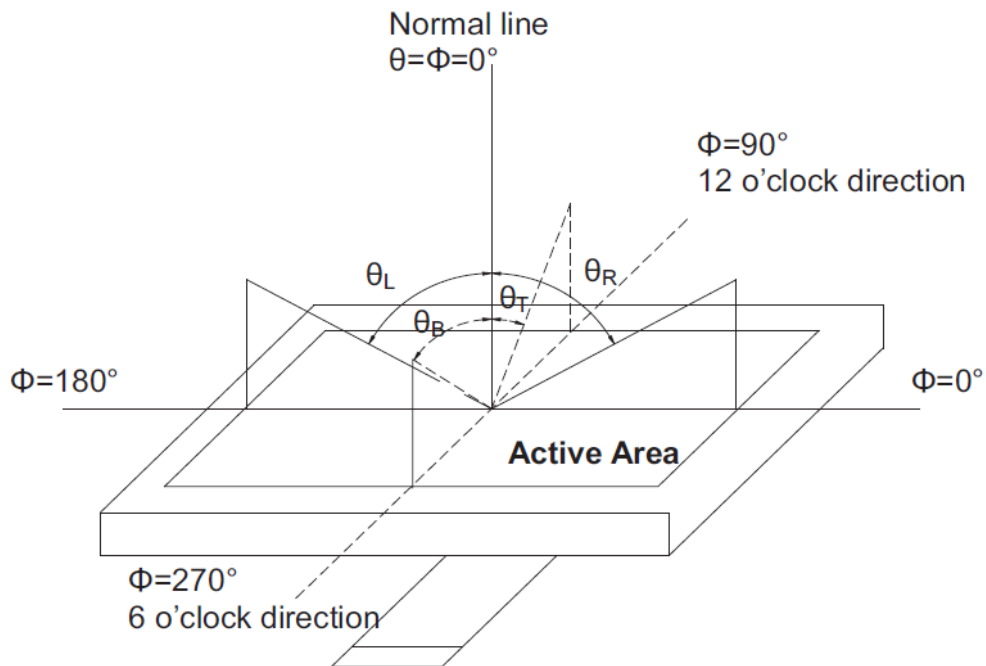
Note 3: Response time is defined as follow:

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



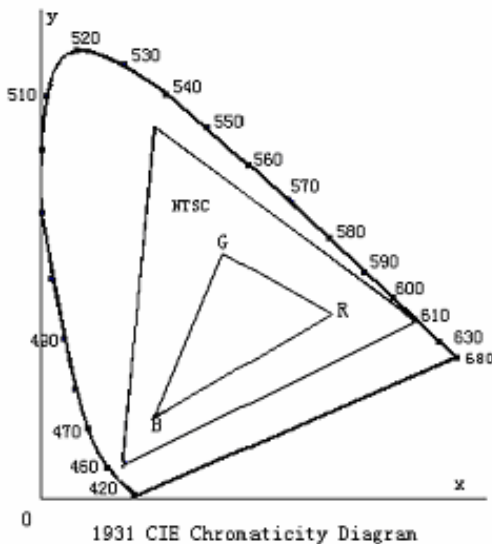
Note 4: Viewing angle range is defined as follow:

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.

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

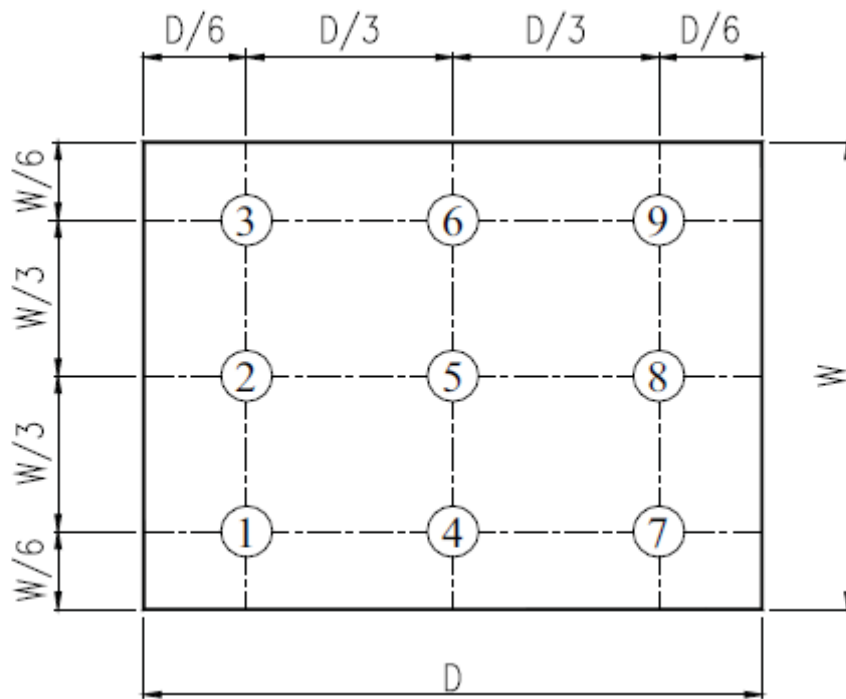


Fig. 2 Definition of uniformity

## 10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ta=+75°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-30°C, 120hrs	Per table in below
3	High Temp Storage	Ts=+80°C, 120hrs	Per table in below
4	Low Temp Storage	Ts=-40°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ts=+50°C, 90% RH, 120hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+75°C 30 min, Change time:5min, 20 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.
- F. Peel off the LCM protective film slowly since static electricity may be generated.

### 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, All Shore 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.

