



# Microtips

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## TECHNOLOGY

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## Record of Revision

Date	Revision No.	Summary
2016-06-15	1.0	Rev 1.0 was issued

### 1. Scope

This data sheet is to introduce the specification of **MTD0801PZL** active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 8.01" display area contains 1600 x 3(RGB) x 480 pixels.

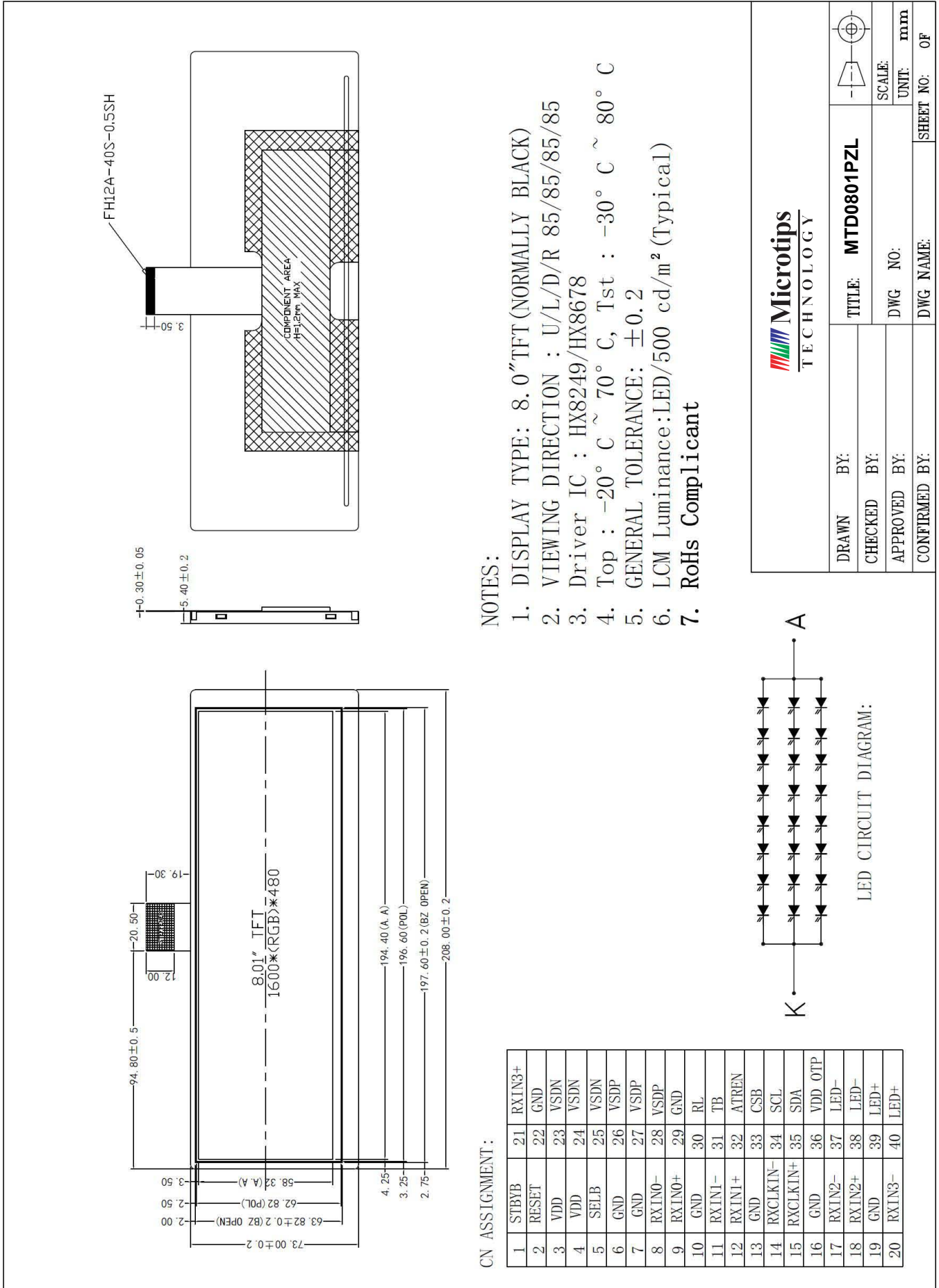
### 2. Application

Digital equipments which need color display, rearview mirror, driving recorder etc.

### 3. General Information

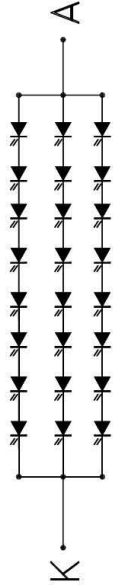
Item	Contents	Unit
Size	8.01	inch
Resolution	1600 x 3(RGB) x 480	/
Interface	LVDS	/
Technology type	a-si TFT	/
Pixel pitch	40.5(H)x121.5(V)	um
Pixel Configuration	R.G.B stripe	
Outline Dimension (W x H x D)	208.0 x 73.0 x 5.4	mm
Active Area	194.4 x 58.32	mm
Display Mode	Transmissive, Normally Black	/
Source Driver IC	HX8249	
Gate Driver IC	HX8678	
Backlight Type	LED	/

4. Outline Drawing



CN ASSIGNMENT:

1	STBYB	21	RXIN3+
2	RESET	22	GND
3	VDD	23	VSDN
4	VDD	24	VSDN
5	SELB	25	VSDN
6	GND	26	VSDP
7	GND	27	VSDP
8	RXIN0-	28	VSDP
9	RXIN0+	29	GND
10	GND	30	RL
11	RXIN1-	31	TB
12	RXIN1+	32	ATREN
13	GND	33	CSB
14	RXCLKIN-	34	SCL
15	RXCLKIN+	35	SDA
16	GND	36	VDD OTP
17	RXIN2-	37	LED-
18	RXIN2+	38	LED-
19	GND	39	LED+
20	RXIN3-	40	LED+



NOTES:

1. DISPLAY TYPE: 8.0" TFT (NORMALLY BLACK)
2. VIEWING DIRECTION : U/L/D/R 85/85/85/85
3. Driver IC : HX8249/HX8678
4. Top : -20° C ~ 70° C, Tst : -30° C ~ 80° C
5. GENERAL TOLERANCE: ±0.2
6. LCM Luminance: LED/500 cd/m<sup>2</sup> (Typical)
7. RoHS Compliant



DRAWN BY:	TITLE: MTD0801PZL	
CHECKED BY:	DWG NO:	SCALE:
APPROVED BY:	DWG NAME:	UNIT: mm
CONFIRMED BY:	SHEET NO: OF	

## 5. Interface signals

The recommended connector is HIROSE FH12A-40S-0.5SH or equivalent.

Pin No.	Symbol	I/O	Function	Remark
1	STBYB	I	Enable IC	Note2
2	RESET	I	Reset IC	Note3
3	VDD	P	Digital power_3.3V	+3.3V
4	VDD	P	Digital power_3.3V	+3.3V
5	SELB	I	6bit/8bit mode select	Note3
6	GND	P	Ground	
7	GND	P	Ground	
8	RXIN0-	I	Negative LVDS differential data input	
9	RXIN0+	I	Positive LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	Negative LVDS differential data input	
12	RXIN1+	I	Positive LVDS differential data input	
13	GND	P	Ground	
14	RXCLKIN-	I	Negative LVDS differential data input	
15	RXCLKIN+	I	Positive LVDS differential data input	
16	GND	P	Ground	
17	RXIN2-	I	Negative LVDS differential data input	
18	RXIN2+	I	Positive LVDS differential data input	
19	GND	P	Ground	
20	RXIN3-	I	Negative LVDS differential data input	
21	RXIN3+	I	Positive LVDS differential data input	
22	GND	P	Ground	
23	VSDN	P	Power for Driver IC	-5.5V
24	VSDN	P	Power for Driver IC	-5.5V
25	VSDN	P	Power for Driver IC	-5.5V
26	VSDP	P	Power for Driver IC	+5.5V
27	VSDP	P	Power for Driver IC	+5.5V
28	VSDP	P	Power for Driver IC	+5.5V
29	GND	P	Ground	
30	RL	I	Horizontal shift direction	Note5
31	TB	I	Vertical shift direction	Note5
32	ATREN	I	Only for OTP program	
33	CSB	-	SPI	
34	SCL	-	SPI	
35	SDA	-	SPI	

36	VDD_OTP	P	7.5V for OTP program	
37	LED-	P	LED cathode	
38	LED-	P	LED cathode	
39	LED+	P	LED anode	
40	LED+	P	LED anode	

Note 1: I: input, O: output, P: Power/Ground

Note 2: STBYB="H(3.3V)" : normal operation;

STBYB="L(GND)" : timing controller, source driver will turn off, all output are High-Z

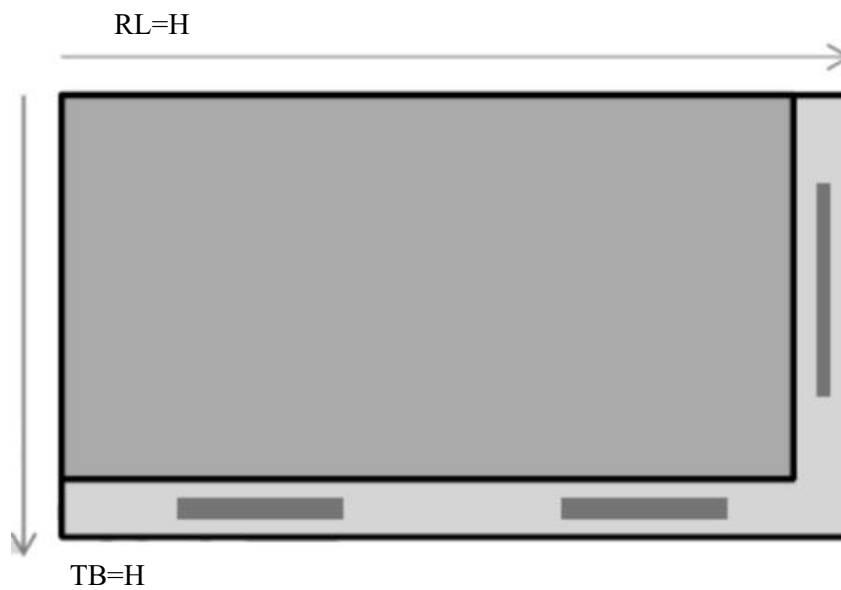
Note 3: Suggest to connect with an RC reset circuit for stability, Normally pull high.

(47kΩ+0.1 uF or external MCU control)

Note 4: If LVDS input data is 8 bits, SELB must be set to High.

Note 5:

Scan Control Input		Scanning direction
RL	TB	
VDD	VDD	Up to down, left to right
GND	VDD	Up to down, right to left
VDD	GND	Down to up, left to right
GND	GND	Down to up, right to left



## 6. Absolute maximum Ratings

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in the table as below:

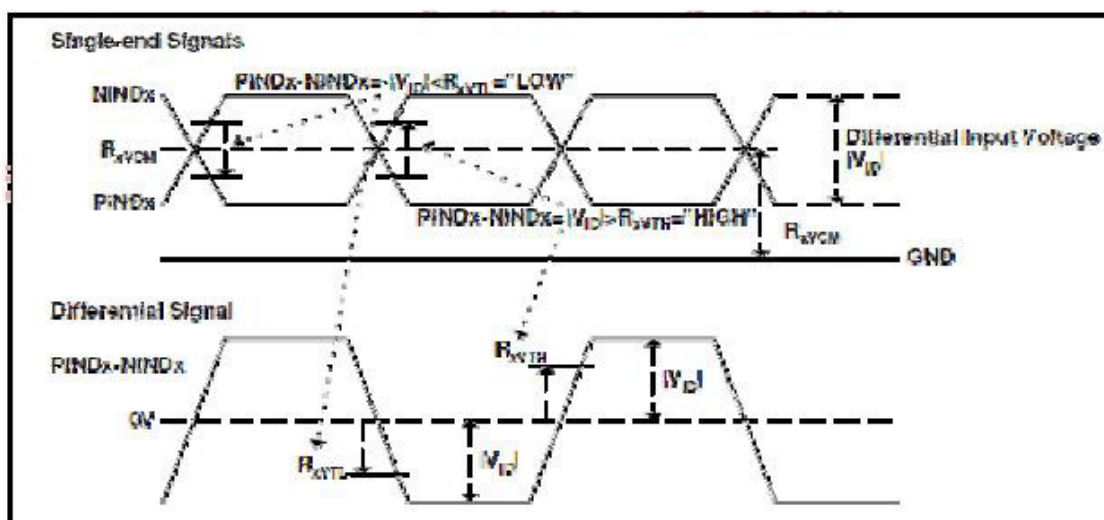
Parameter	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VDD	2.8	3.5	V	Note
Operating Temperature	TOP	-20	+70	°C	
Storage Temperature	TST	-30	+80	°C	

Notes: Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

## 7. Electrical Specifications

### 7.1 Electrical characteristics

Item	Symbol	MIN	TYP	MAX	Unit	Remark	
Power Supply Input Voltage	VDD	3.0	3.3	3.6	V		
Power Supply Ripple Voltage	VRP	-	-	50	mV		
Power Consumption	PDD	TBD	TBD	TBD	W	1,2	
LVDS Interface	Differential input high threshold voltage	VLVTH	100	300	mV		
	Differential input low threshold voltage	VLVTL	-300	-100	mV		
	Common input voltage	VLVC	1	1.2	$1.7 -  V_{id} /2$	V	
	Differential input voltage	$ V_{id} $	0.2	-	0.6	V	
CMOS interface	Input high threshold voltage	VIH	2.6	3.3	V		
	Input low threshold voltage	VIL	0	0.8	V		



Note 1: The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDD = 3.3V, Frame rate fV = 60 Hz and Clock frequency = 52.59 MHz. Test Pattern of power supply current is Black.

Note 2: The duration of rush current is about 2ms and rising time of power input is 1 ms(min)

## 7.2 Panel Electrical Specifications

Parameter	Symbol	MIN	TYP	MAX	Unit	Remark
Digital Voltage	VDD	3.0	3.3	3.6	V	
Power for driver IC & GMA	VSDP	5.4	5.5	5.6	V	
Power for driver IC & GMA	VSDN	-5.6	-5.5	-5.4	V	

## 7.3 LED Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	--	20	25	mA	For each LED
Forward Voltage	VF	23.2	25.6	27.2	V	
LED life time	--	-	25000	--	Hr	

Note1: The LED driving condition is defined for each LED channel.

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at Ta=25°C only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



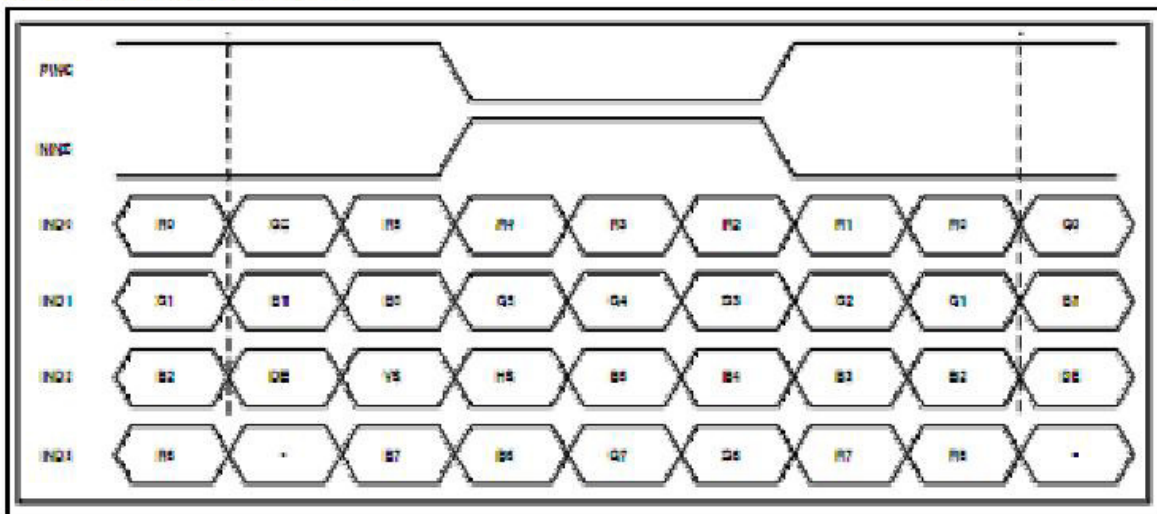
## 8. Signal timing specifications

### 8.1 Timing Parameters (Sync mode)

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK Frequency	Fdclk	48.69	52.59	60.83	MHz	
Horizontal valid data	Thd	1600			DCLK	
Hsync pulse width	Thpw	1	2	140	DCLK	
Hsync back porch	Thbp	5	16	141	DCLK	
Hsync front porch	Thfp	19	44	155	DCLK	
1 Horizontal line	Th	1656	1660	1760	DCLK	
Vertical valid data	Tvd	480			H	
Vsync pulse width	Tvpw	1	2	90	H	
Vsync back porch	Tvbp	5	5	91	H	
Vsync front porch	Tvfp	5	43	91	H	
1 Vertical field	Tv	490	528	576	H	

Notes: This product is sync mode.

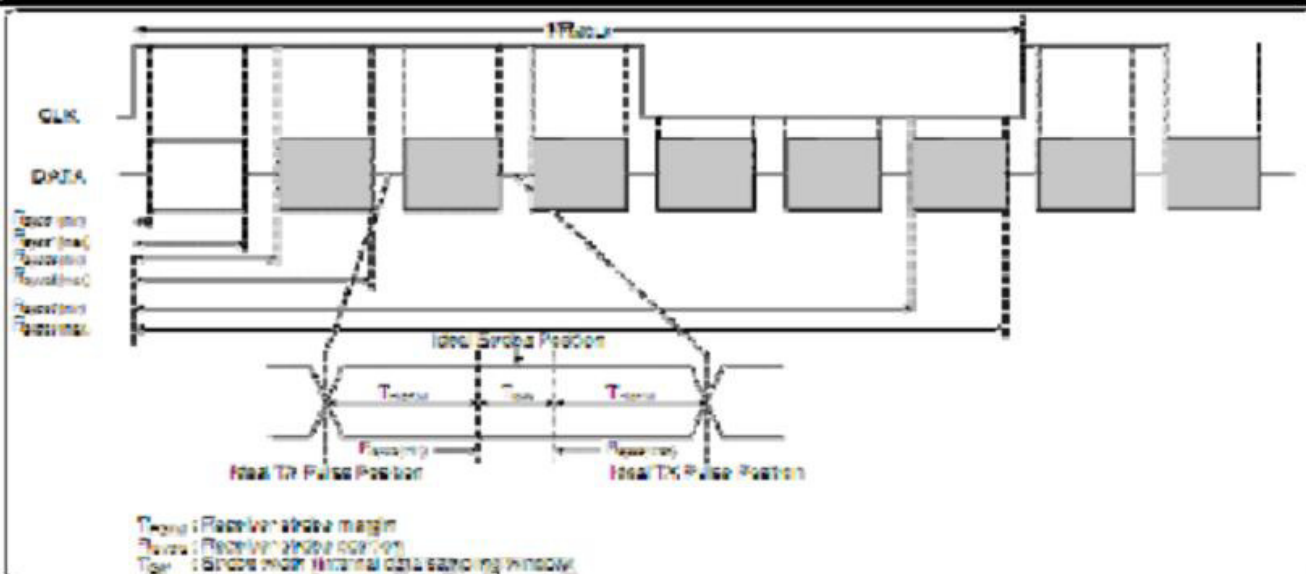
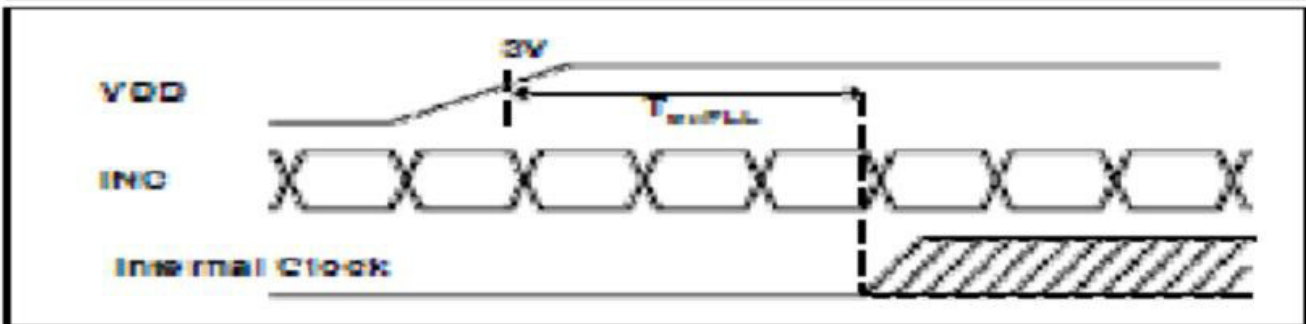
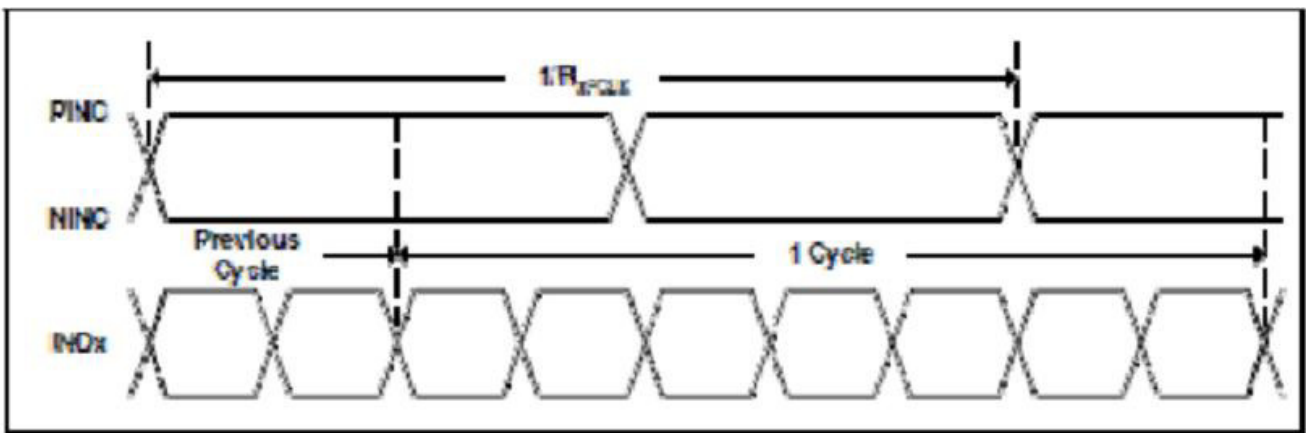
8-bit LVDS input (HSD='L')



## 8.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is as below:

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	RxFCLK	51.02	52.59	54.17	MHz	
Input data skew margin	TRSKM	500	-	-	ps	VID  = 400mV RxVCM = 1.2V RxFCLK = 52.59 MHz
Clock high time	TLVCH	-	$4/(7 * RxFCLK)$	-	ns	
Clock low time	TLVCL	-	$3/(7 * RxFCLK)$	-	ns	
PLL wake-up time	TenPLL			150	us	

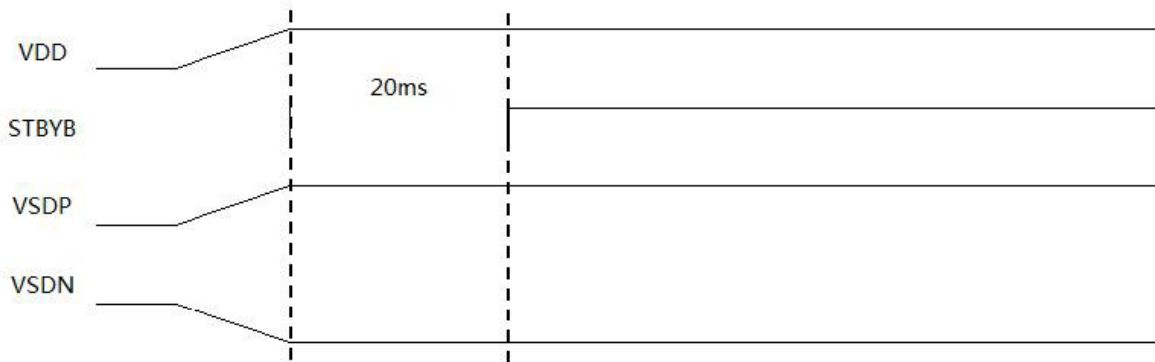


### 8.3 Input Signals , Basic Display Colors & Gray Scale of Colors

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		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 Colors	Black	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
	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
	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
	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
Gray Scale of Red	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	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
Gray Scale of Green	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	1	0	0	0	0	0	0	0	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	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
Gray Scale of Blue	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	1	
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	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
Gray Scale of White	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	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	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

## 8.4 Power Sequence

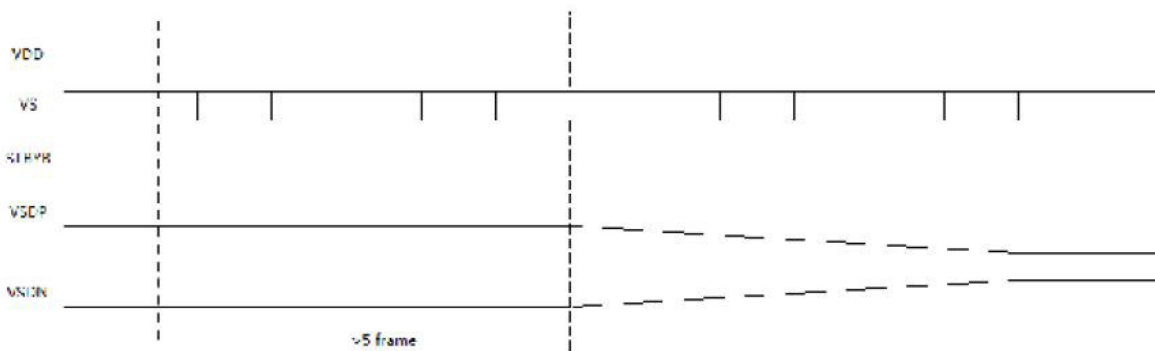
### Power on Sequence



**Note:**

1. When the power supply VDD is 0V , keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.  
Backlight must be turn on after power for logic and interface signal are valid.

### Power off Sequence



### 9. Optical Specification

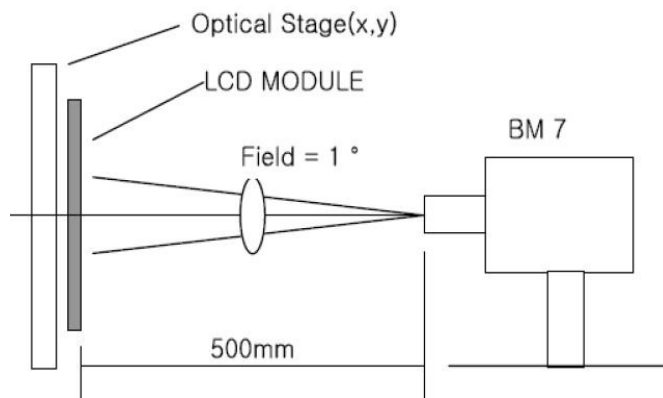
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	Normal $\theta = \Phi = 0^\circ$	700	900	-		Note1 Note2
Response Time	Tg		-	25	35	ms	Note1 Note3
View Angles	$\Theta T$	$CR \geq 10$	-	85	-	Degree	Note 4
	$\Theta B$		-	85	-		
	$\Theta L$		-	85	-		
	$\Theta R$		-	85	-		
Chromaticity	White	x	Normal $\theta = \Phi = 0^\circ$	Typ.-0.03	Typ.+0.03		Note5, Note1
		y					
	Red	x					
		y					
	Green	x					
		y					
	Blue	x					
		y					
Luminance	L	450	500	-	cd/m <sup>2</sup>	Note1 Note6	
Color Gamut	-	45	50	-	%	NTSC	
Gamma Scale		1.9	2.2	2.5			
Uniformity	U	70	75	-	%	Note1 Note7	

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

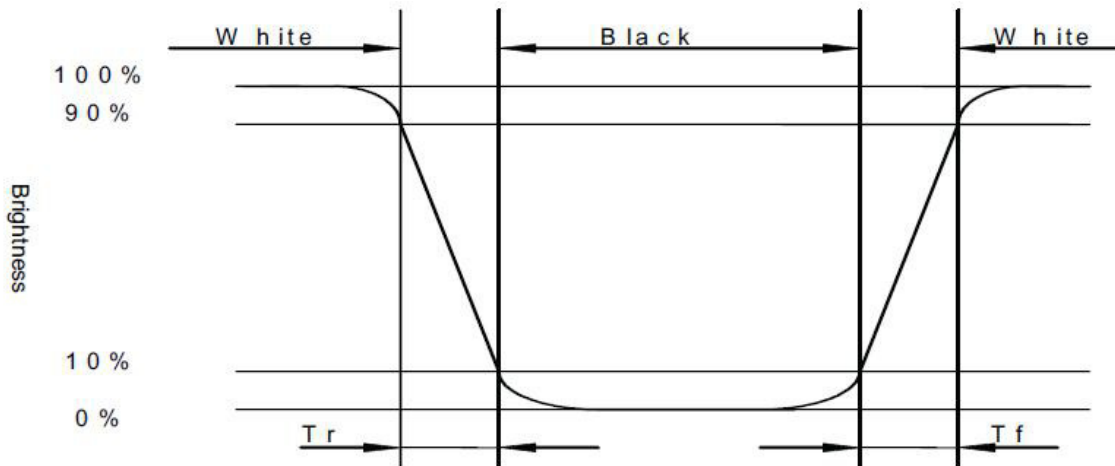


Note 2: Contrast ratio is defined as follow:

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

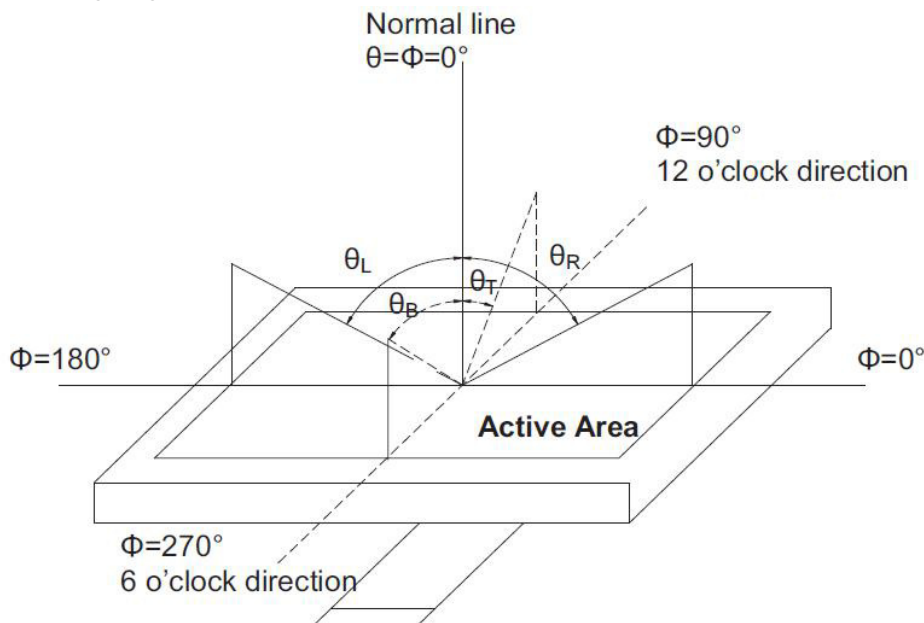
Note 3: Response time is defined as follow:

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,  $T_f$ ).



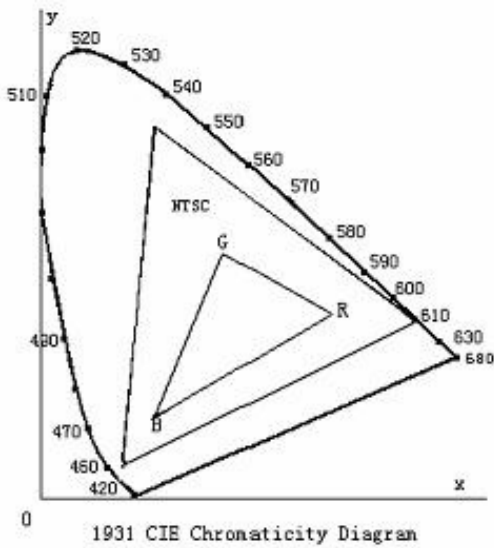
Note 4: Viewing angle range is defined as follow:

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.

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

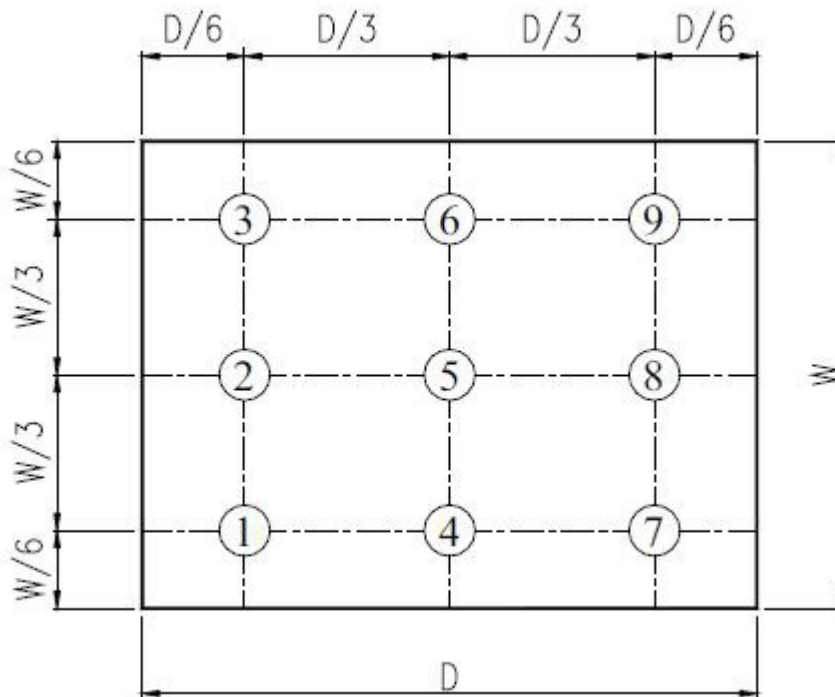


Fig. 2 Definition of uniformity



10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-20°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+80°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-30°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+40°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+85°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

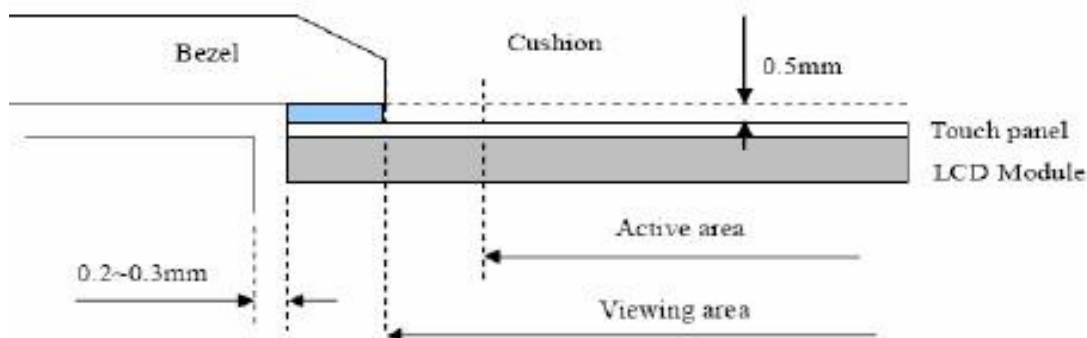
- A. Store the products in a dark place at  $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$  with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.
- B. Storage in a clean environment, free from dust, active gas, and solvent.

### 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

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.



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