

The logo features a stylized graphic of three slanted bars in red, green, and blue. To the right of this graphic, the word "Microtips" is written in a large, bold, black serif font. Below "Microtips", a thick horizontal line spans the width of the text. Underneath this line, the word "TECHNOLOGY" is written in a smaller, black, all-caps serif font with wide letter spacing.

Microtips
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Model No: MTD1010PZK

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Record of Revision

Date	Revision No.	Summary
2017-04-21	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of **MTD1010PZK** active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 10.1" display area contains 1024x(RGB)x600 pixels.

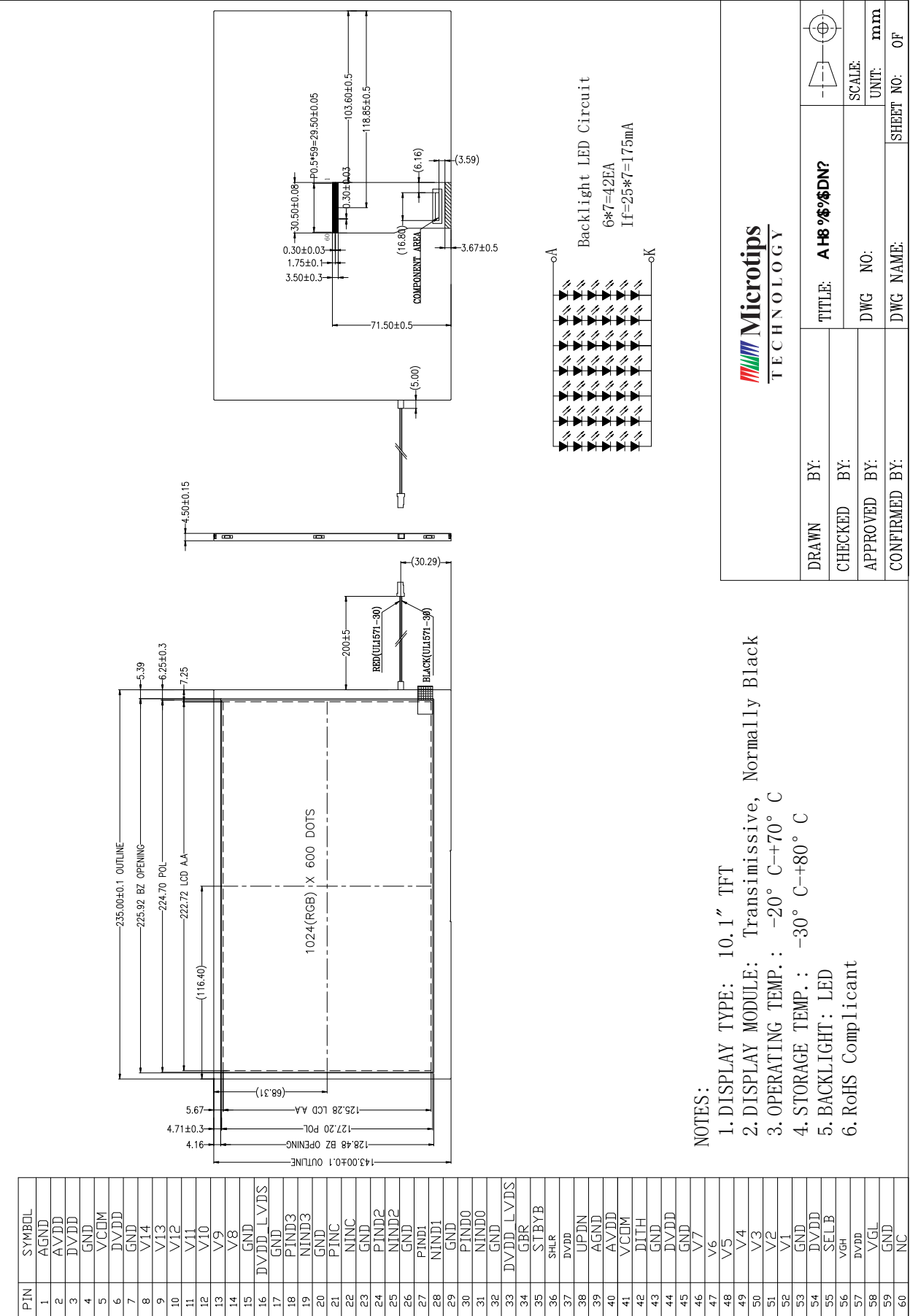
2. Application

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

3. General Information

Item	Contents	Unit
Size	10.1	inch
Resolution	1024x(RGB)x600	/
Interface	LVDS	/
Technology type	IPS	/
Pixel pitch	0.2175x0.2088	mm
Pixel Configuration	RGB stripes	
Outline Dimension (W x H x D)	235 x 143 x 4.5	mm
Active Area	222.72 x 125.28	mm
Display Mode	Transmissive, Normally Black	/
Backlight Type	LED	/
Weight	255.88(±10%)	g

4. Outline Drawing



DRAWN BY:	TITLE: AHB %\$&DN?	SCALE:	mm
CHECKED BY:	DWG NO:	UNIT:	mm
APPROVED BY:	DWG NAME:	SHEET NO:	OF
CONFIRMED BY:			

- NOTES:**
1. DISPLAY TYPE: 10.1" TFT
 2. DISPLAY MODULE: Transmissive, Normally Black
 3. OPERATING TEMP.: -20° C--+70° C
 4. STORAGE TEMP.: -30° C--+80° C
 5. BACKLIGHT: LED
 6. RoHS Compliant

PIN	SYMBOL
1	AGND
2	AVDD
3	DVDD
4	GND
5	VCOM
6	DVDD
7	GND
8	V14
9	V13
10	V12
11	V11
12	V10
13	V9
14	V8
15	GND
16	DVDD_LVDS
17	GND
18	PIND3
19	NIND3
20	GND
21	PINC
22	NINC
23	GND
24	PIND2
25	NIND2
26	GND
27	PIND1
28	NIND1
29	GND
30	PIND0
31	NIND0
32	GND
33	DVDD_LVDS
34	GBR
35	STBYB
36	SHLR
37	DVDD
38	UPDN
39	AGND
40	AVDD
41	VCOM
42	DITH
43	GND
44	DVDD
45	GND
46	V7
47	V6
48	V5
49	V4
50	V3
51	V2
52	V1
53	GND
54	DVDD
55	SELB
56	VGH
57	DVDD
58	VGL
59	GND
60	NC

5. Interface signals

FPC Connector is used for the module electronics interface. The recommended model is FH12A-60S-0.5SH manufactured by Hirose.

Pin No.	Symbol	Function	Remark
1	AGND	Power ground	
2	AVDD	Analog Power	
3	DVDD	Digital Power	
4	GND	Power ground	
5	VCOM	Common Voltage	
6	DVDD	Digital Power	
7	GND	Power Ground	
8	V14	No connection	
9	V13	No connection	
10	V12	No connection	
11	V11	No connection	
12	V10	No connection	
13	V9	No connection	
14	V8	No connection	
15	GND	Power ground	
16	DVDD_LVDS	LVDS Power	
17	GND	Power ground	
18	PIND3	+LVDS differential data input	
19	NIND3	-LVDS differential data input	
20	GND	Power ground	
21	PINC	+LVDS differential clock input	
22	NINC	-LVDS differential clock input	
23	GND	Power ground	
24	PIND2	+LVDS differential data input	
25	NIND2	-LVDS differential data input	
26	GND	Power ground	
27	PIND1	+LVDS differential data input	
28	NIND1	-LVDS differential data input	
29	GND	Power ground	
30	PIND0	+LVDS differential data input	
31	NIND0	-LVDS differential data input	
32	GND	Power ground	

33	GND_LVDS	Power ground	
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10kΩ, C=1μF)	
35	STBYB	Standby mode, Normally pulled high STBYB=1, normal operation STBYB=0, timing controller, source driver will turn Off, all output are High-Z	
36	SHLR	Horizontal inversion	Note2
37	DVDD	Digital Power	
38	UPDN	Vertical inversion	Note2
39	AGND	Power ground	
40	AVDD	Analog Power	
41	VCOM	Common voltage	
42	DITH	Dithering setting: DITHB="H" 8bit resolution(default setting) DITHB="L" 6bit resolution(last 2 bit of input data truncated)	
43	GND	Power ground	
44	DVDD	Digital Power	
45	GND	Power ground	
46	V7	No connection	
47	V6	No connection	
48	V5	No connection	
49	V4	No connection	
50	V3	No connection	
51	V2	No connection	
52	V1	No connection	
53	GND	Power ground	
54	DVDD	Digital Power	
55	SELB	6bit/8bit mode select	Note1
56	VGH	Positive Power for TFT	
57	DVDD	Digital Power	
58	VGL	Negative Power for TFT	
59	GND	Power ground	
60	NC	No connection	

Note 1: If LVDS input data is 6 bits, SELB must be set to High;
If LVDS input data is 8 bits, SELB must be set to Low.

Note 2: When L/R="0", set right to left scan direction.
When L/R="1", set left to right scan direction.
When L/R="0", set top to bottom scan direction.
When L/R="1", set bottom to top scan direction.

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Digital Supply Voltage	VDD VDD_LVDS	-0.3	-	5	V	
Analog Supply Voltage	AVDD	-0.5	-	15	V	
Gate On Voltage	VGH	-0.3	-	25	V	
Gate Off Voltage	VGL	-20	-	0.3	V	
Gate On-Gate off Voltage	VGH-VGL	-0.3	-	40	V	

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

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	Note
TFT Gate ON Voltage	VGH	20	20.2	20.4	V	
TFT Gate OFF Voltage	VGL	-10.3	-10.1	-9.9	V	
TFT Common Electrode Voltage	VCOM	4.15	4.35	4.55	V	
Analog Power Supply Voltage	AVDD	10	10.2	10.4	V	

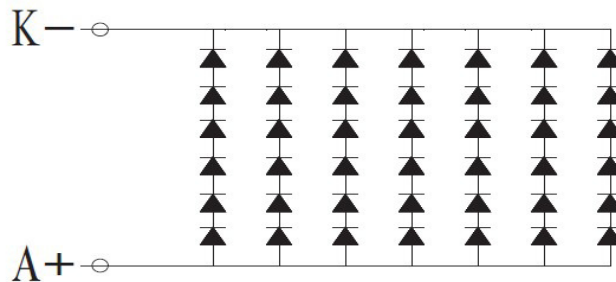
Note: TYP VCOM is only reference value. It must be optimized according to each LCM. Be sure to use VR and OP buffer on VCOM output. Please adjust VCOM to make the flicker level be minimum for getting excellent image.

7.2 Current Consumption

Item	Symbol	Condition	Values			Unit	Remark
			MIN	TYP	MAX		
Gate on Current	IVGH	VGH=20.2V	-	0.3	-	mA	
Gate off Current	IVGL	VGL=-10.2V	-	1.85	-	mA	
Digital Current	IVDD	VDD=3.3V	-	14.7	-	mA	
Analog Current	IAVDD	AVDD=10.2V	-	26.4	-	mA	

7.3 LED Backlight

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
LED Current	ILED	-	175	-	mA	Total LED
Forward Voltage	VF	18	19.8	21.6	V	IF=175mA
Reverse Current	Ir	-	-	50	uA	VR=5V,1LED
Power dissipation	Pd	3465			mW	Total LED
Peak forward current	I _{fp}	100			mA	1LED
Reverse voltage	VR	5			V	1LED



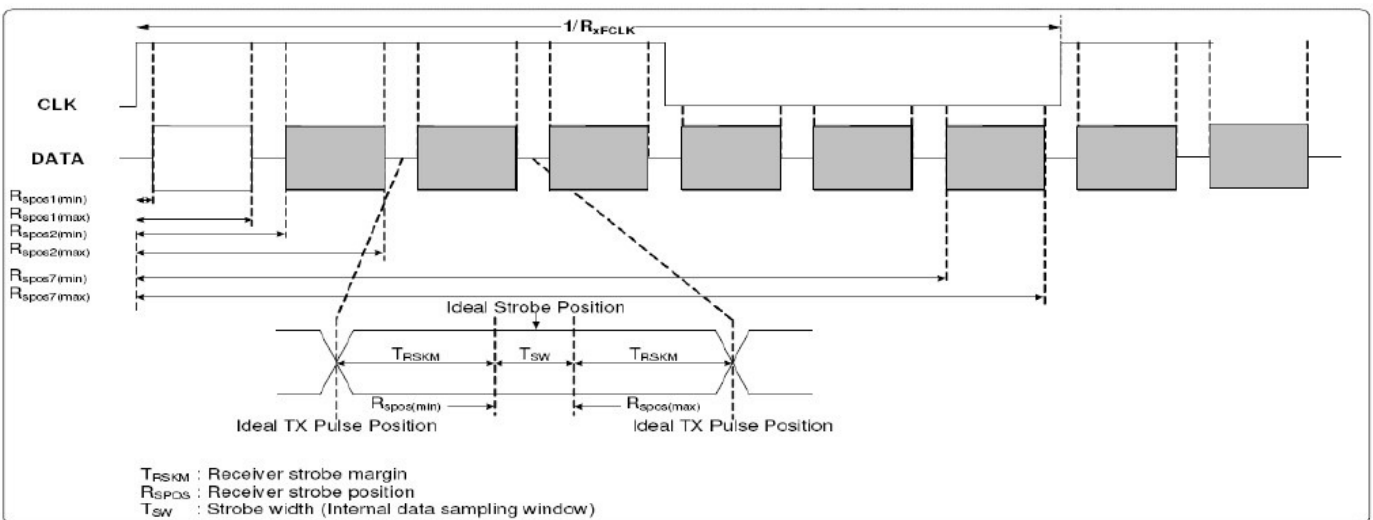
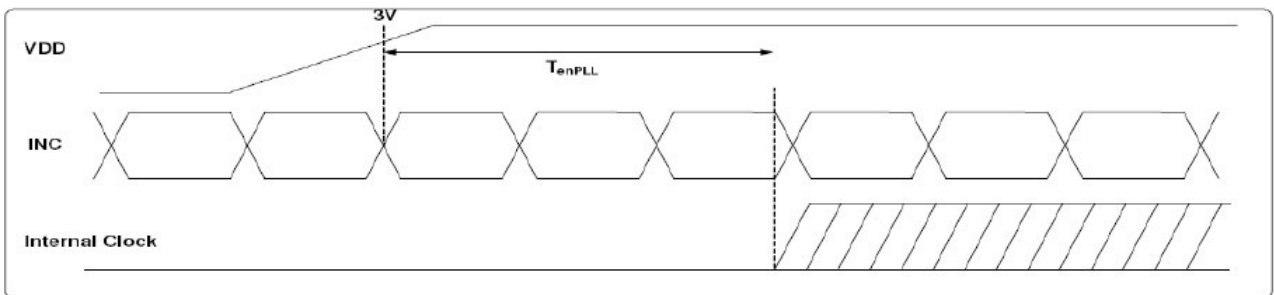
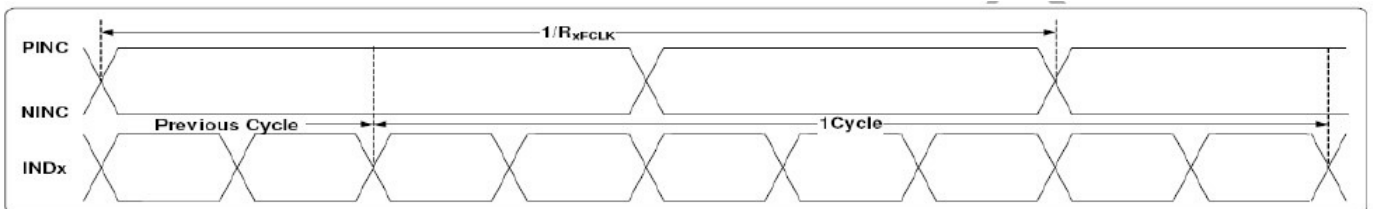
$$6 * 7 = 42 \text{ LED} \quad 25 * 7 = 175 \text{ mA}$$

8. Command/AC Timing

8.1 AC Electrical Characteristics

LVDS Mode AC Electrical Characteristics

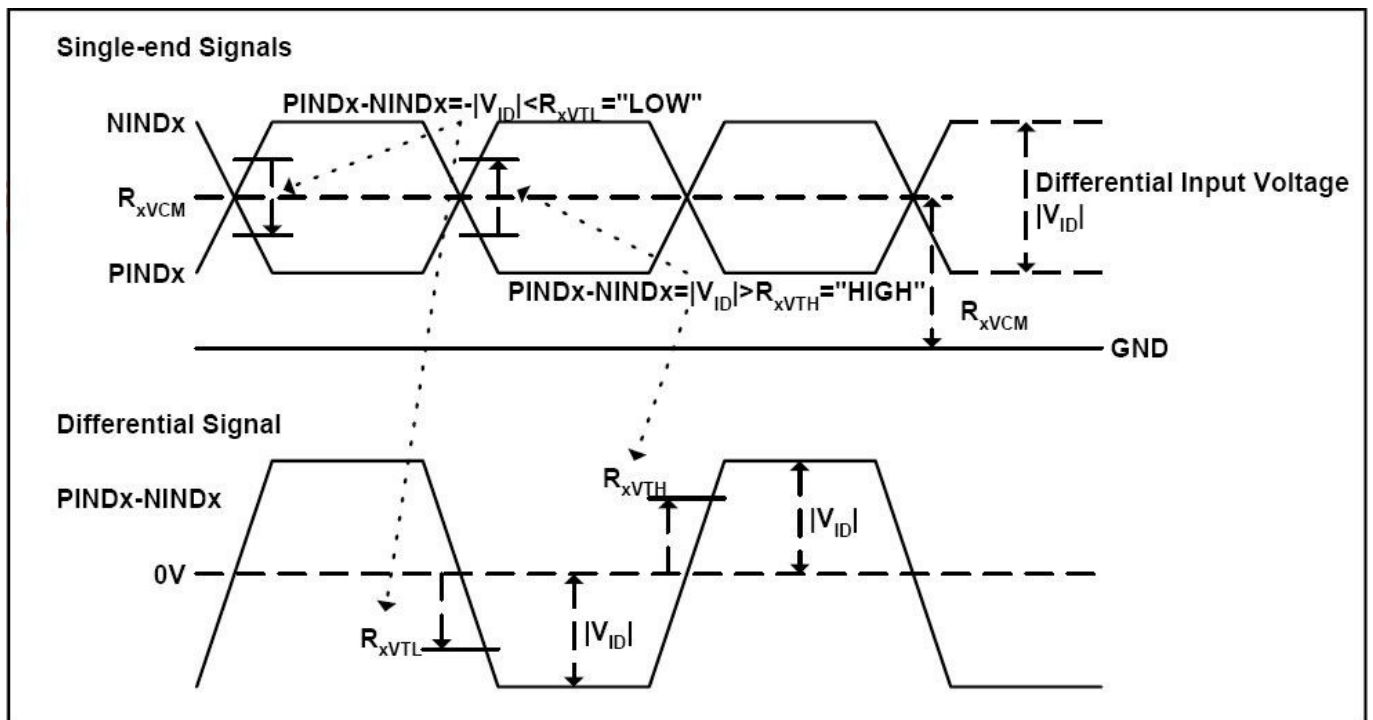
Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	RxFCLK	20	-	71	MHz	-
Input data skew margin	TRSKM	500	-	-	PS	VID =400Mv RXVCM=1.2V RxFCLK=71MHz
Clock high time	TLVCH	-	$4/(7 * RxFCLK)$	-	ns	-
Clock low time	TLVCL	-	$3/(7 * RxFCLK)$	-	ns	-
PLL wake-up time	TemPLL	-	-	150	μs	-



8.2 DC Electrical Characteristics

LVDS Mode DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	RxVTH	-	-	0.1	V	RXVCM=1.2V
Differential input low Threshold voltage	RxVTL	-0.1	-	-	V	
Input voltage range(singled-end)	RXVIN	0		VDD-1.2+ VID /2	V	
Differential input common mode voltage	RxVCM	VID /2	-	VDD-1.2	V	
Differential Input voltage	VID	0.2	-	0.6	mV	
Differential Input leakage Current	RVXliz	-10	-	10	uA	
LVDS Digital Operating Current	Iddlvs	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvs	-	10	50	uA	Clock & all Functions are stopped



8.3 INPUT TIMING TABLE

8.3.1 DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	40.8	51.2	67	MHz
Horizontal Display Area	thd	1024			DCLK
HS period	th	1114	1344	1400	DCLK
HS Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tvd	600			TH
VS period	tv	642	652	845	TH
VS Blanking	tvbp+tvfp	10	38	77	TH

8.3.2 HV Mode

Horizontal Timing

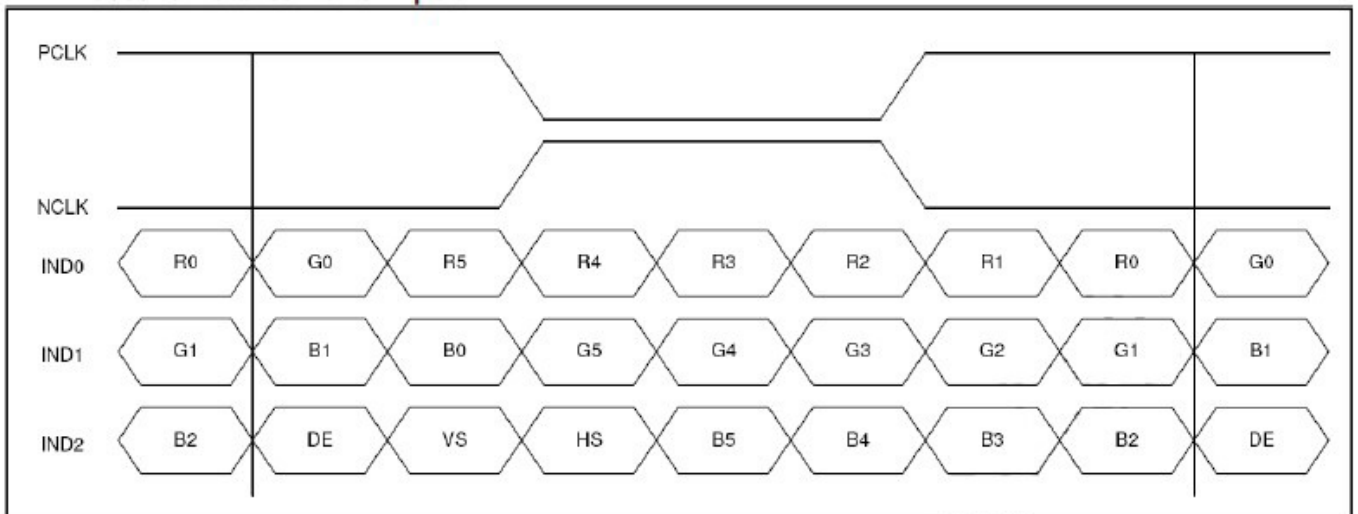
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	40.8	51.2	67	MHz
Horizontal Display Area	thd	1024			DCLK
HS period	th	1200	1344	1400	DCLK
HS Pulse width	thpw	1	-	140	DCLK
HS Back Porch	thbp	160			DCLK
HS Front Porch	thfp	16	160	216	DCLK

Vertical Timing

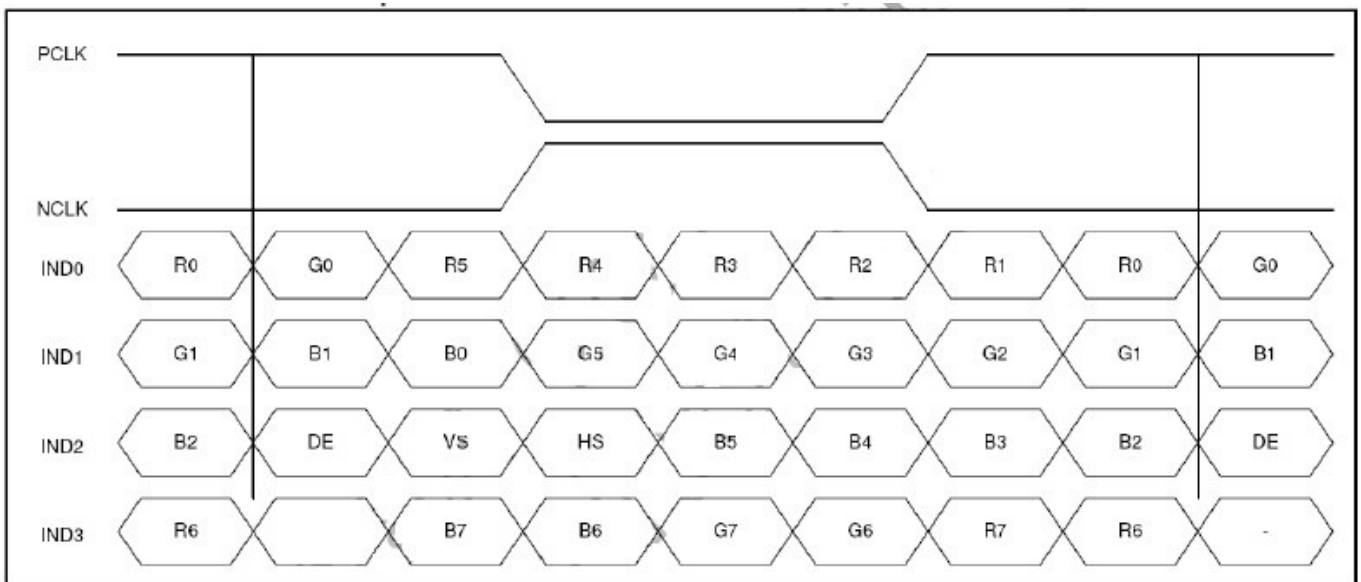
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	600			TH
VS period	tv	642	652	840	TH
VS Pulse width	tvpw	1	-	20	TH
VS Back Porch	tvbp	23			TH
VS Front Porch	tvfp	1	15	49	TH

8.4 LVDS Data Input Format

8.4.1 6-bits LVDS Input



8.4.2 8-bits LVDS Input

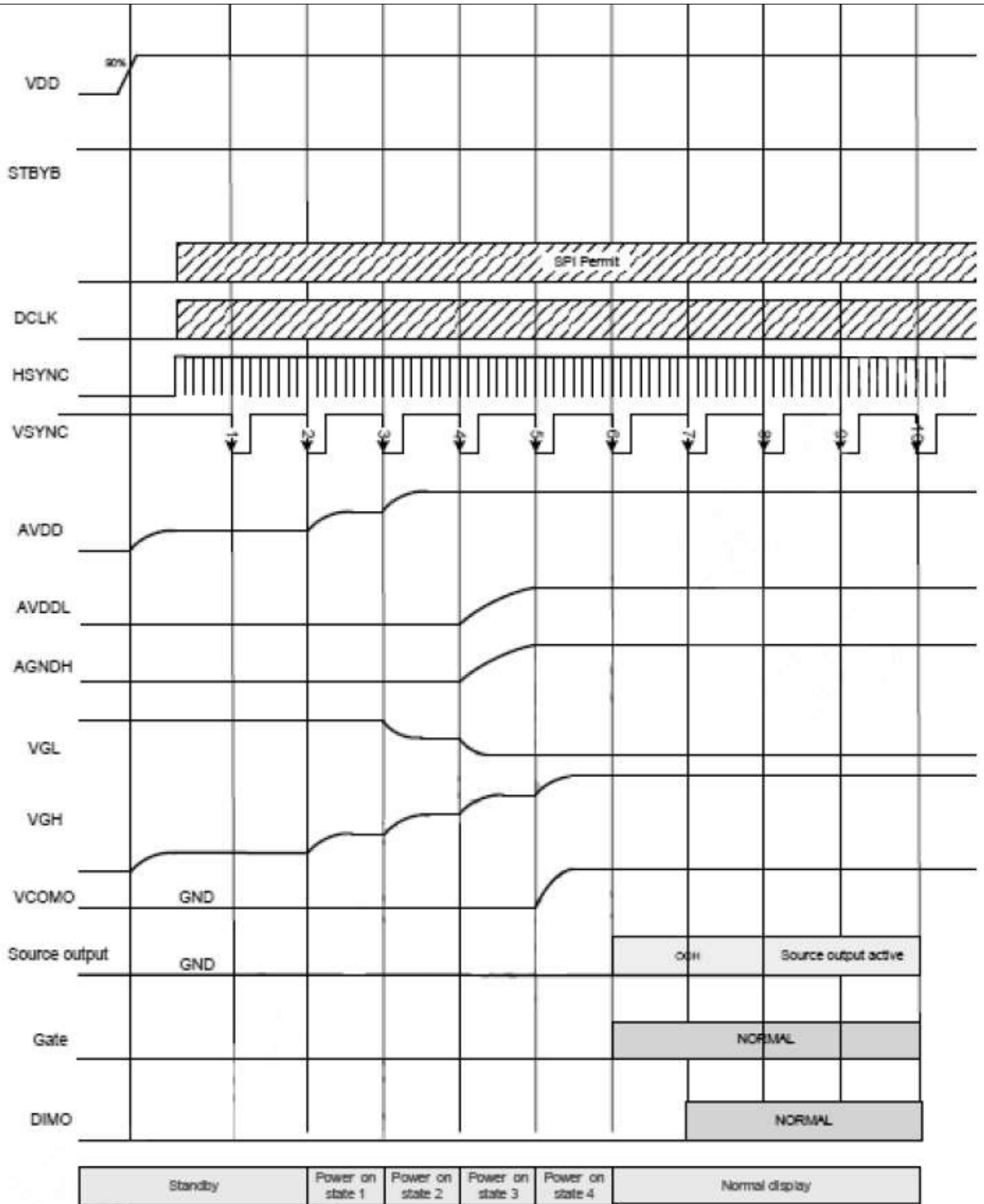


8.5 Power ON/OFF Sequence

To prevent the device damage from latch up, the power on/off sequence shown below must be followed.

Power ON: VDD, GND_AVDD, AGND_V1 to V14

Power OFF: V1 to V14_AVDD, AGND_VDD, GND



Note: Low level=3FH, when NVW=L (Normally white)
 Low level=00H, when NBW=H (Normally black)

9. Optical Specification

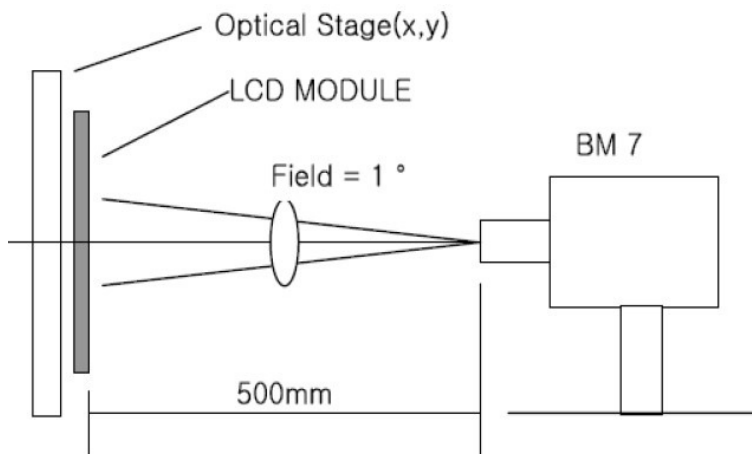
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	-	500	-		Note1 Note2
Response Time	TRT	25°C	-	20	40	ms	Note1 Note3
View Angles	ΘT	$CR \geq 10$	-	80	-	Degree	Note 4
	ΘB		-	80	-		
	ΘL		-	80	-		
	ΘR		-	80	-		
Chromaticity	White	Brightness is on	x	0.283	0.313	0.343	Note5, Note1
			y	0.299	0.329	0.359	
	Red		x	0.523	0.573	0.623	
			y	0.292	0.342	0.392	
	Green		x	0.261	0.311	0.361	
			y	0.531	0.581	0.631	
	Blue		x	0.095	0.145	0.195	
			y	0.063	0.113	0.163	
Luminance	L		-	500	-	cd/m ²	Note1 Note6
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

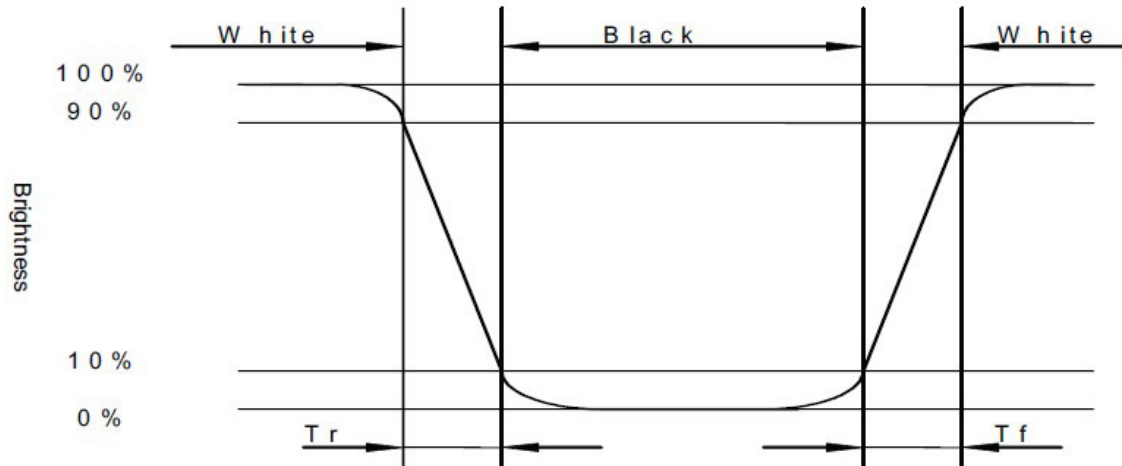


Note 2: Contrast ratio is defined as follow:

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

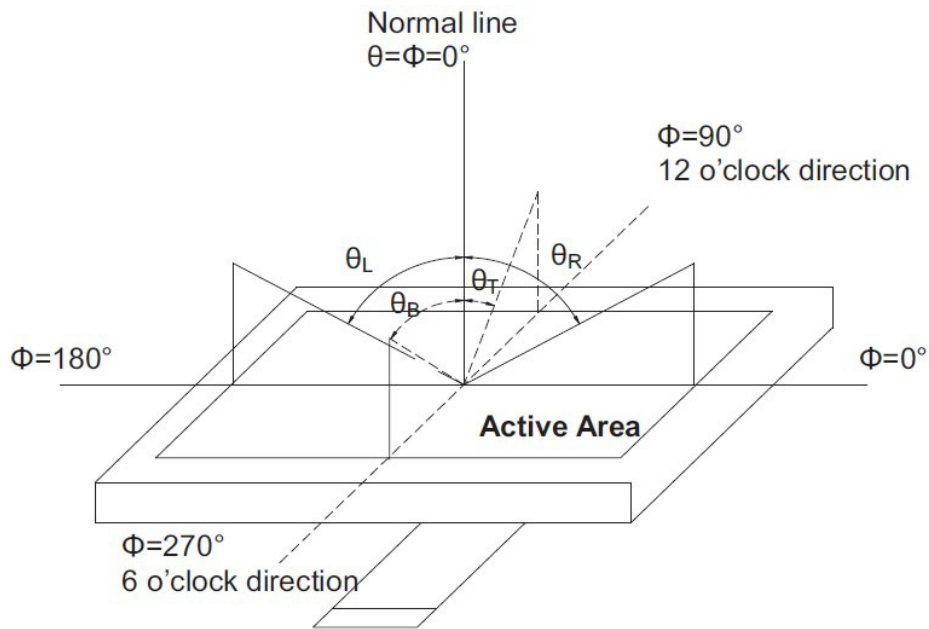
Note 3: Response time is defined as follow:

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).

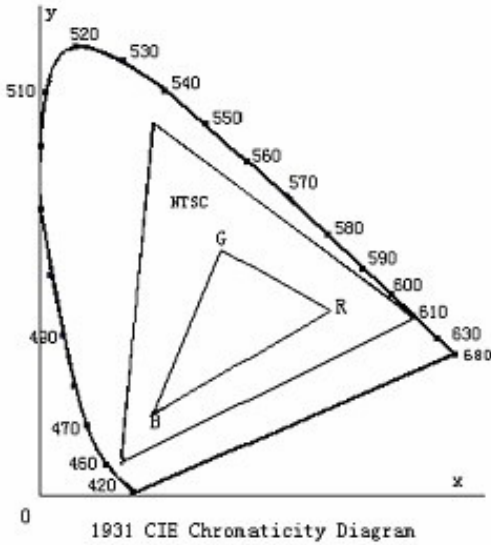


Note 4: Viewing angle range is defined as follow:

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.

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

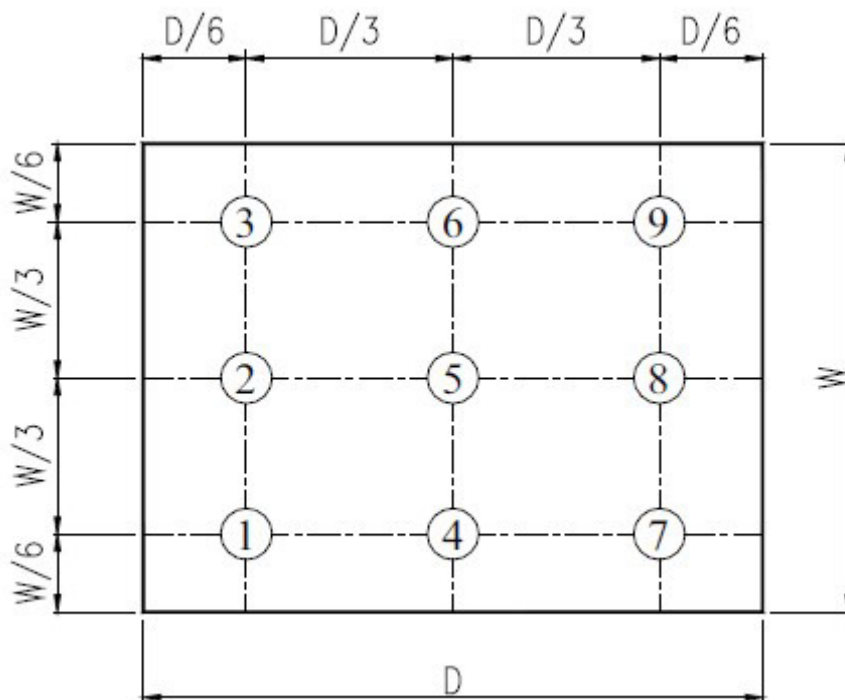


Fig. 2 Definition of uniformity

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=+60°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C/30 min ~ +80°C/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Per table in below
7	ESD (Non-Operation)	150pF,330Ω, Contact: ±4KV, Air: ±8KV 200pF,0Ω, ±200V Contact test	Per table in below
8	Vibration(Non-operation)	Frequency range:10~55Hz, Stroke:1.0mm Sweep:10Hz~55Hz~10Hz 1 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non-operation)	980m/s ² , 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:60 cm, 1 corner, 3 edges, 6 surfaces	Per table in below
11	Package Vibration Test	Random Vibration : ISTA-3A 1Hz~200Hz,Grms=0.53 Half hours for direction of Z.	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.

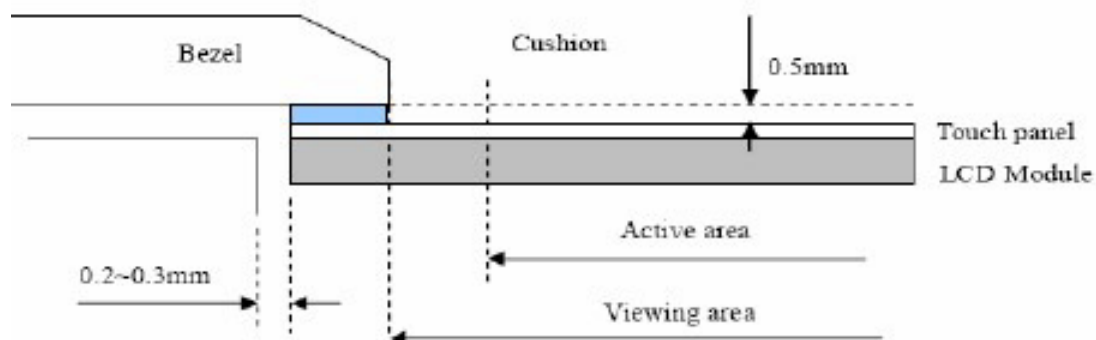
11.5 Cleaning

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

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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