深圳市拓普微科技开发有限公司
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT070FNMFWA-NND

LCD Module User Manual

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Date: 2019-07-31	Date:	Date:

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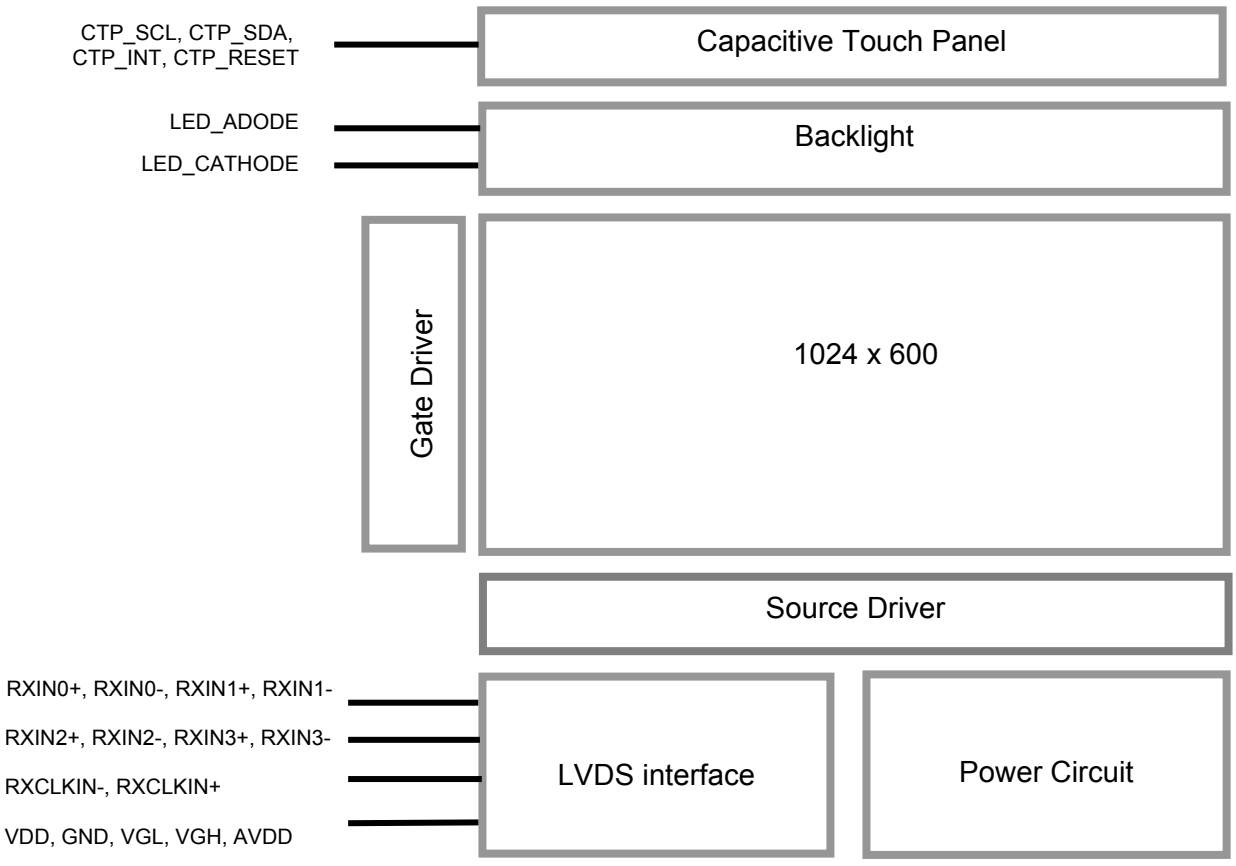
1. General Specification

Signal Interface :	LVDS（VESA 24 bit）
Display Mode :	SFT Transmissive / Normally Black
Screen Size(Diagonal) :	7.0”
Outline Dimension :	195.8 x 116.0x 8.75(mm) (see attached drawing for details)
Active Area :	154.21 x 85.92 (mm)
Number of dots :	1024 x 3 (RGB) x 600
Pixel Pitch :	0.1506 x 0.1432 (mm)
Pixel Configuration :	RGB Stripe
Backlight :	LED
Viewing Direction :	All
Touch Panel:	Capacitive Touch Panel
Touch Driver IC:	ILI2118A
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C
Surface Treatment :	AF

2. Block Diagram



3. Terminal Function

3.1 K1 LVDS Terminal

Pin No.	Pin Name	I/O	Descriptions
1	NC	---	No connection
2	VDD	P	Power Voltage for LCD digital circuit(3.3V)
3	RESET	I	Global reset pin, low active
4	VGH	P	Gate ON Voltage
5	VGL	P	Gate OFF Voltage
6	AVDD	P	Power for Analog Circuit
7	GND	P	Ground
8	RXIN0-	I	- LVDS differential data input
9	RXIN0+	I	+LVDS differential data input
10	GND	P	Ground
11	RXIN1-	I	-LVDS differential data input
12	RXIN1+	I	+LVDS differential data input
13	GND	P	Ground
14	RXIN2-	I	-LVDS differential data input
15	RXIN2+	I	+LVDS differential data input
16	GND	P	Ground
17	RXCLKIN-	I	-LVDS differential clock input
18	RXCLKIN+	I	+LVDS differential clock input
19	GND	P	Ground
20	RXIN3-	I	-LVDS differential data input
21	RXIN3+	I	+LVDS differential data input
22	GND	P	Ground
23	VDD	P	Power Voltage for CTP digital circuit(3.3V)
24	GND	P	Ground
25	NC	---	No connection
26	NC	---	No connection
27	CTP_SCL	I	I2C clock input
28	CTP_SDA	I/O	I2C data input and output
29	CTP_INT	O	Interrupt signal from the TP IC
30	CTP_RESET	I	Reset pin for CTP, low active
31	LED_A	P	LED Anode
32	LED_A	P	LED Anode
33	GND	P	Ground
34	LED_K	P	LED Cathode
35	LED_K	P	LED Cathode
36	LED_K	P	LED Cathode
37	LED_K	P	LED Cathode
38	LED_K	P	LED Cathode
39	LED_K	P	LED Cathode
40	GND	P	Ground

Note 1:I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No Connection

4. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Power voltage	V_{DD}	-0.3	3.6	V	
Operating Temperature	T_{OP}	-20	70	°C	No Condensation
Storage Temperature	T_{ST}	-30	80	°C	No Condensation

Note:
*1. This rating applies to all parts of the module. And should not be exceeded.
*2. The operating temperature only guarantees operation of the circuit. The contrast, response speed, and the other specification related to electro-optical display quality is determined at the room temperature, T_{OP}=25℃
*3. Ambient temperature when the backlight is lit (reference value)
*4. Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

5. Electrical Characteristics

5.1 DC Characteristics

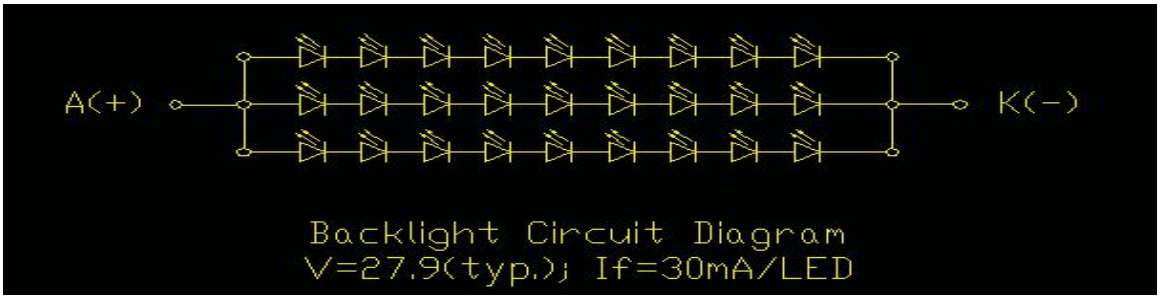
Items	Symbol	Min.	Typ.	Max.	Unit	Remark
Power voltage	VDD	3.0	3.3	3.6	V	
	AVDD	10.2	10.4	10.6	V	
	VGH	14.5	15.0	15.5	V	
	VGL	-10.5.	-10.0	-9.5	V	
Input logic high voltage	VIH	2.3	-	3.3	V	
Input logic low voltage	VIL	0	-	0.5	V	

5.2 LED Backlight Circuit Characteristics

Top=25℃

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Voltage	Vf_{BLA}	27	27.9	28.8	V	If=90mA
Forward Current	If_{BLA}	-	90	-	mA	
Operating Life Time	-	-	30000		-	Hrs

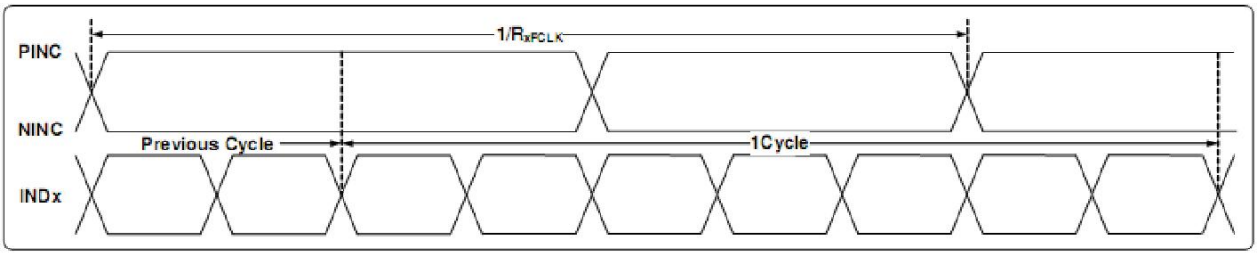
Cautions:
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.
I_F is defined for one channel LED. Optical performance should be evaluated at Ta=25 only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

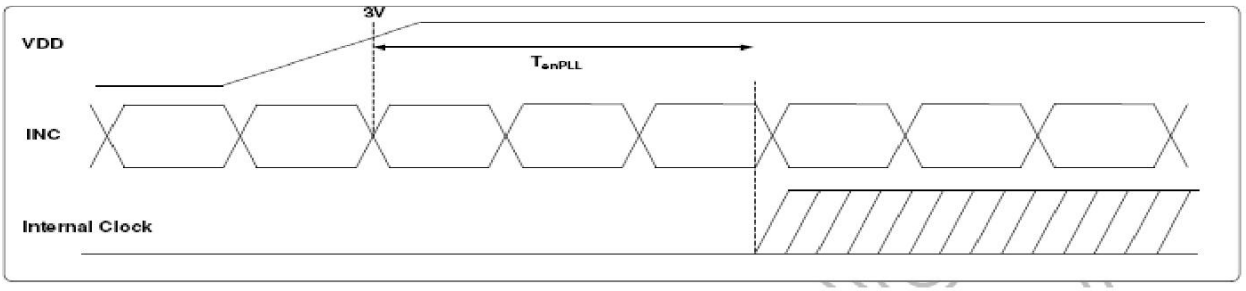


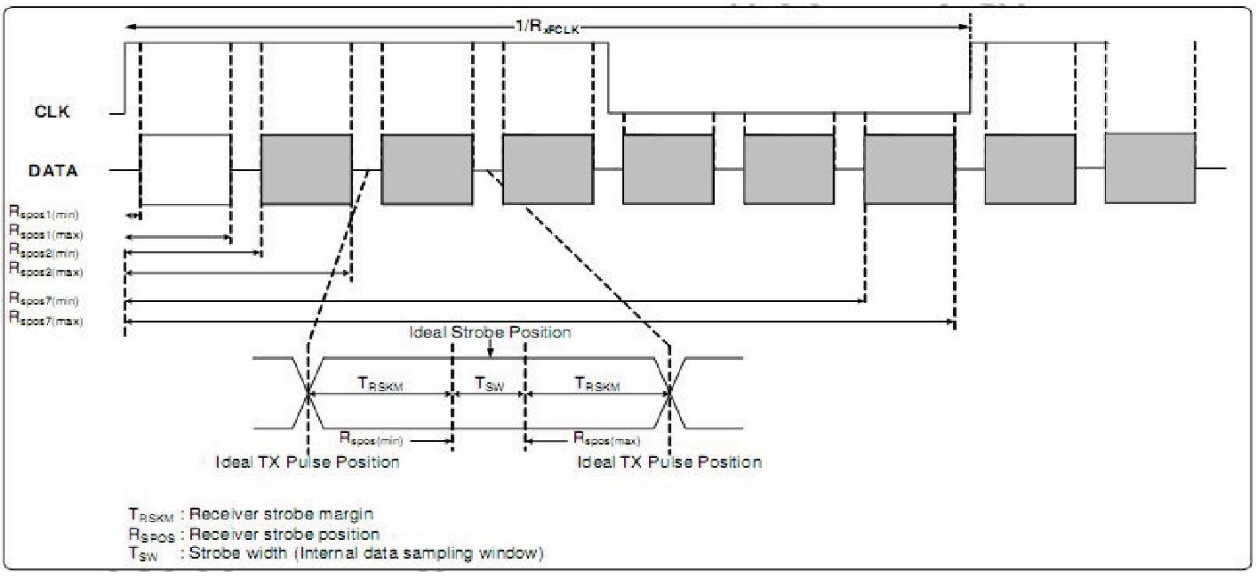
6. AC Characteristics

6.1 AC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Clock Frequency	RxFCLK	20	-	71	MHz	
Input data skew margin	TRSKM	-		500	ps	
Clock high time	TLVCH		4/(7* R_{xFCLK})		ns	
Clock low time	TLVCL		3/(7* R_{xFCLK})		ns	
PLL wake-up time	TenPLL			150	us	



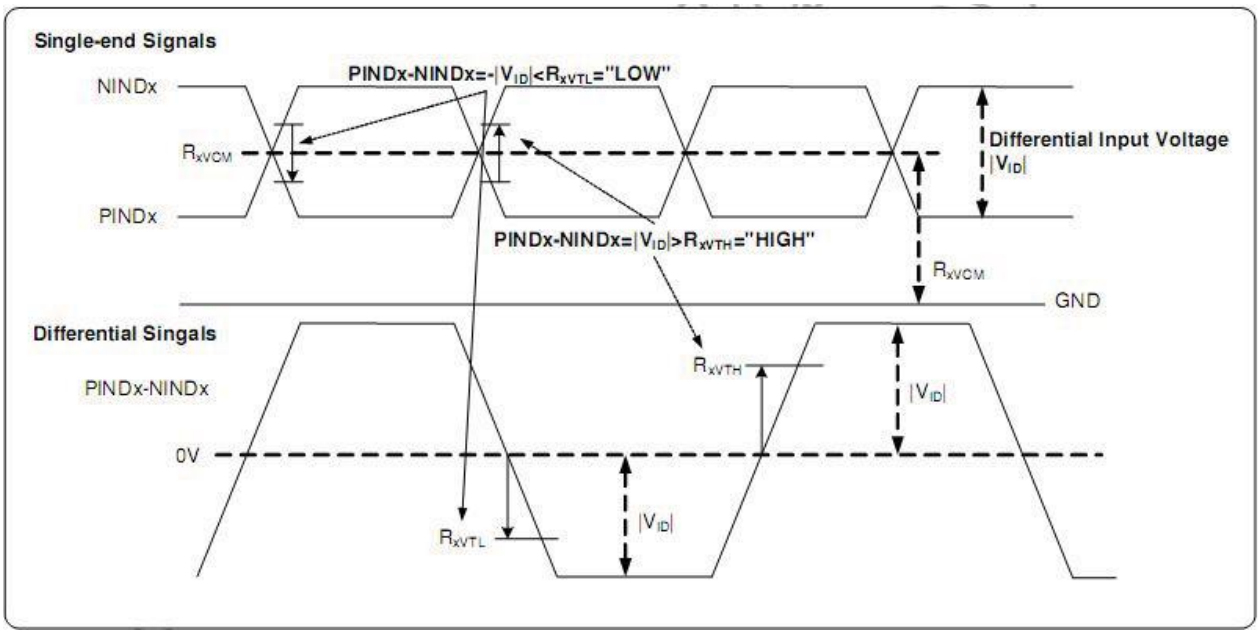




6.2 DC Electrical Characteristics

VDD=3.3V, AVDD=9.6V, AGND=GND=0V, Ta=25

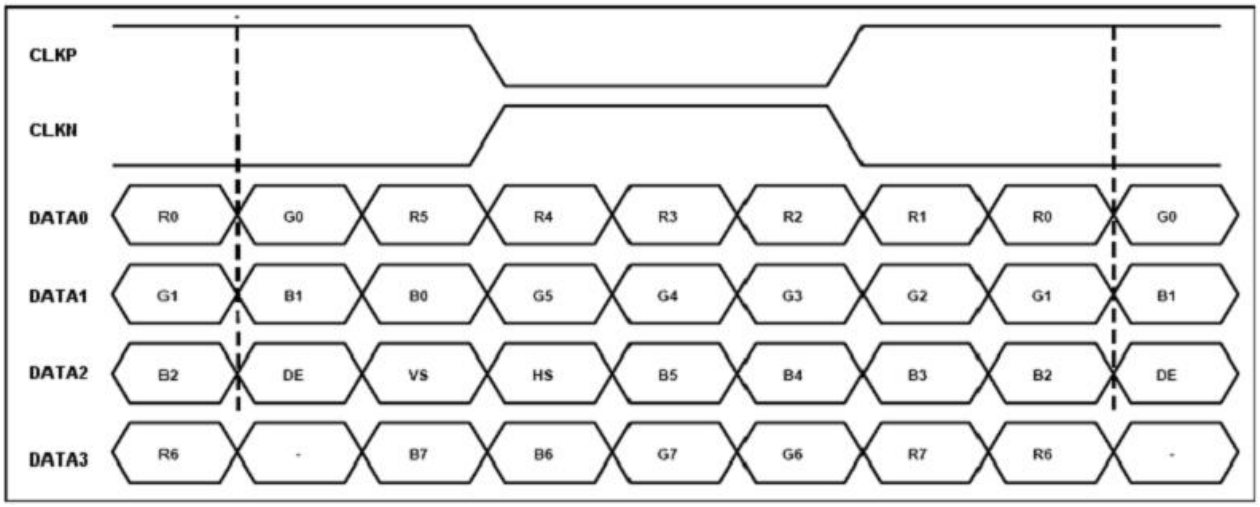
Parameter	Symbol	Min	Typ	Max	Unit	Remark
Differential input high Threshold voltage	RXVTH	–	–	+0.2	V	
Differential input Low Threshold voltage	RXVTL	-0.2	–	–	V	
Input voltage range	RXVIN	0	–	VDD-1.2	V	
Differential input common Mode voltage	RXVCM	$\|V_{ID}\|/2$	–	VDD-1.2+ $\|V_{ID}\|/2$	V	
Differential input voltage	$\|V_{ID}\|$	0.2	v	0.6	V	
Differential input leakage Current	RVXliz	-10	v	+10	uA	
LVDS Digital Operating Current	Iddlvds	–	15	30	mA	Fclk=65MHz,VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	–	10	50	uA	Clock & all functions are stopped



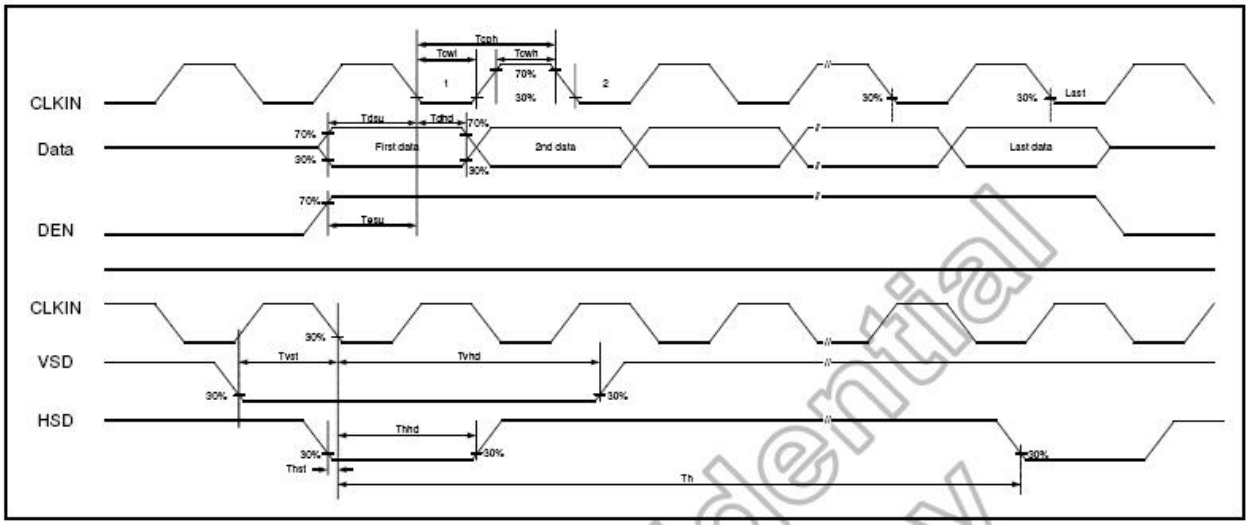
6.3 Timing

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Clock frequency	fclk	44.9	51.2	63	MHz	Frame rate=60Hz
Horizontal display area	thd		1024		DCLK	
HS period time	th	1200	1344	1400	DCLK	
HS Blanking	thbp+thfp	176	320	376	DCLK	
Vertical display area	tvd		600		H	
VS period time	tv	616	760	816	H	
VS Blanking	tvbp+tvfp	16	160	216	H	

6.4 Data Input Format



6.5 Input Clock and Data Timing Diagram



7. Optical Characteristics

7.1 TFT Optical Characteristics

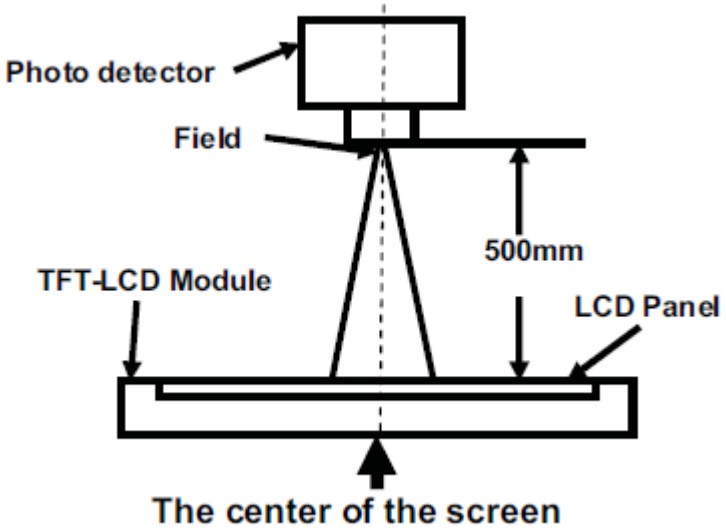
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR 10	70	85	-	Degree	Note 2
		θB		70	85	-		
		θL		70	85	-		
		θR		70	85	-		
Contrast Ratio		CR	θ=0°	600	800	-		Left/right 0 Top/bottom 5
Response Time		T_{ON}	25	-	25	35	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.300	0.305	0.310		Note5 Note1
		y		0.3058	0.3108	0.3158		
	Red	x		0.553	0.603	0.653		
		y		0.310	0.360	0.410		
	Green	x		0.300	0.350	0.400		
		y		0.523	0.573	0.623		
	Blue	x		0.100	0.150	0.200		
		y		0.060	0.110	0.160		
Uniformity		U		70	75	-	%	Note1 Note6
NTSC				45	50	-	%	
Luminance		L		800	-	-	cd/m^2	Note7
Image Sticking			6x8 checker 25 1hour burn-in 186 grey can disappear within 3 min					

Test Conditions:

1. I_F= 90 mA, and the ambient temperature is 25 .
2. The test systems refer to Note 1 and Note 2.

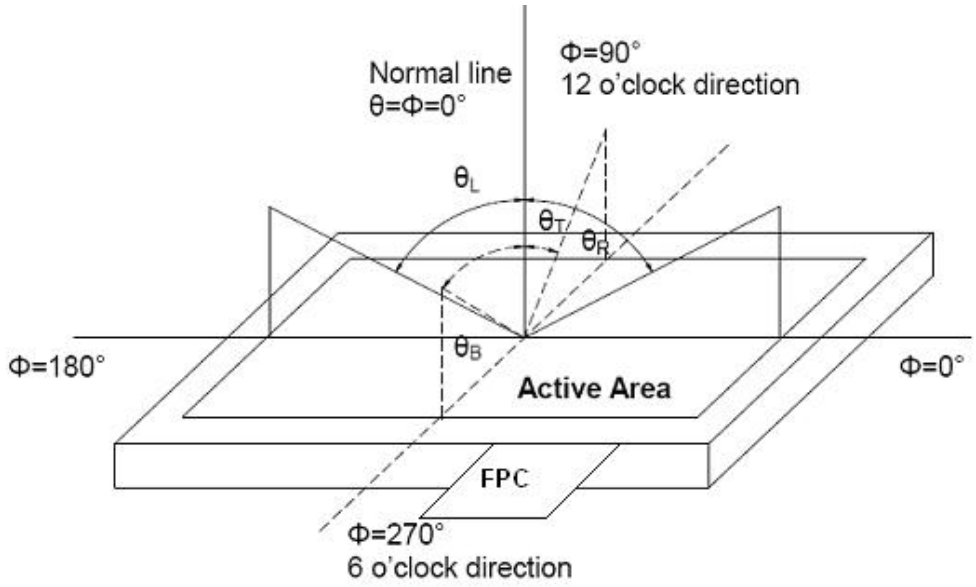
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

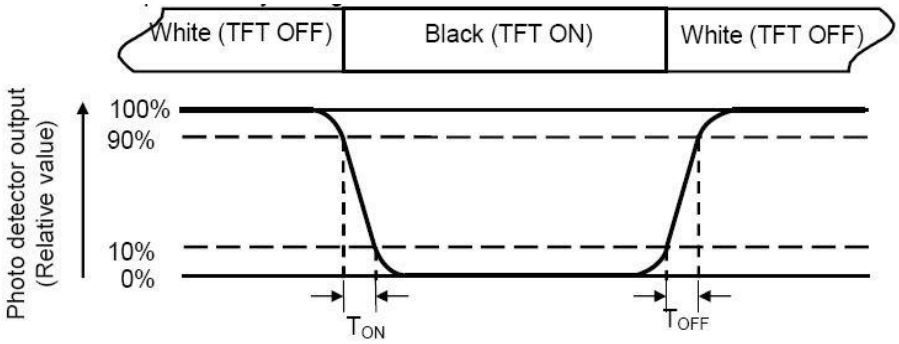
"White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

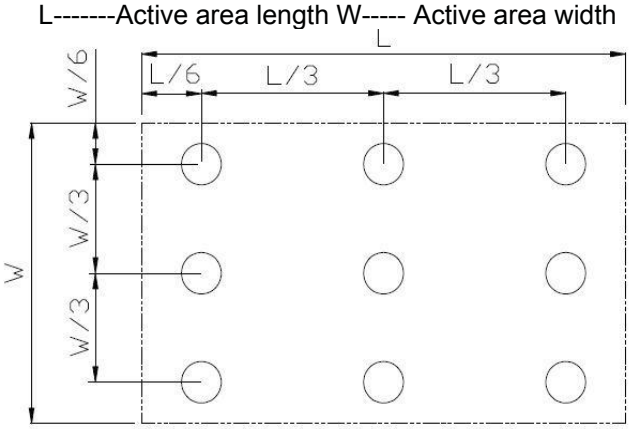
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

L-------Active area length W----- Active area width



Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

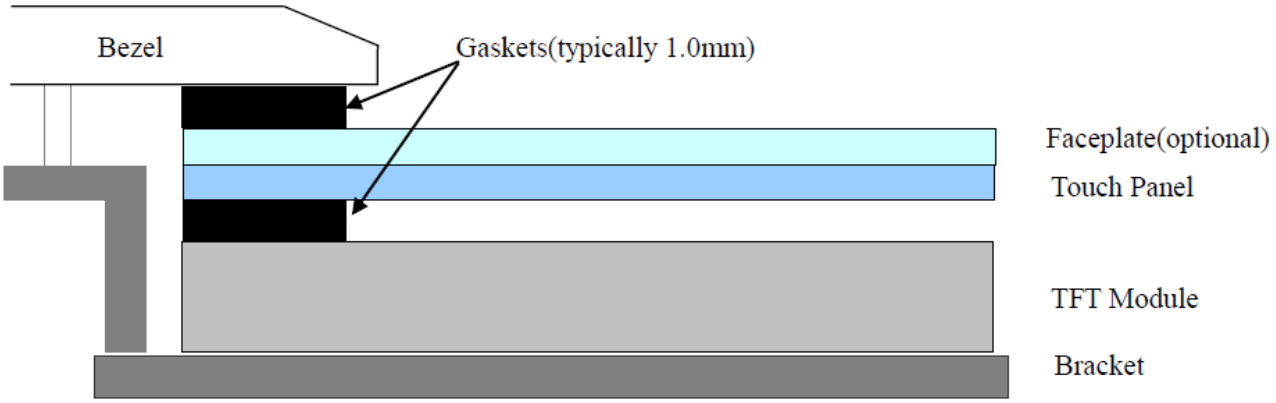
Measure the luminance of white state at center point.

8. Touch panel Design Precautions

8.1 Mounting Precaution

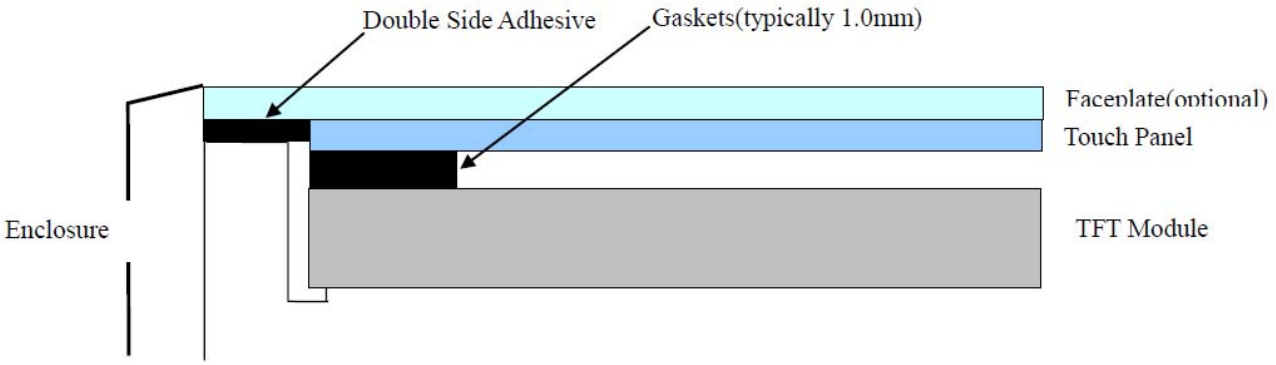
9.1.1 Bezel Mounting

When mounting the CTP underneath a bezel,the CTP assembly should be mounted using a configuration that supports the back surface of the TFT module.The bezel edge must be positioned outside the active area of the CTP.A gap of 0.5mm to 1.0mm is needed between the bezel and the CTP surface.A foam gasket or similar material should be used to compensate for the tolerance of the enclosure,compression for the screw,etc.



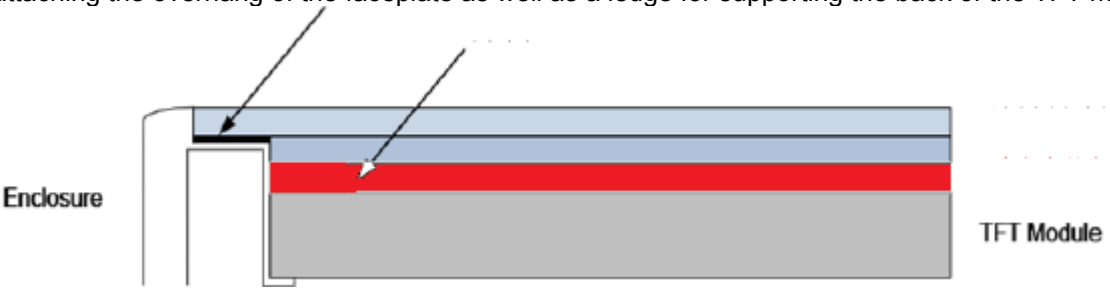
9.1.2 Flush Mounting

When flush mounting the faceplate with the top of the enclosure,the enclosure must have a ledge for attaching the overhang of the faceplate as well as a ledge for supporting the back of the TFT module.



9.1.3 Optical Bonding

When flush mounting the faceplate with the top of the enclosure,the enclosure must have a ledge for attaching the overhang of the faceplate as well as a ledge for supporting the back of the TFT module.



9. Precautions of using LCD Modules

Mounting

- Mounting must use holes arranged in four corners or four sides.
- The mounting structure so provide even force on to LCD module. Uneven force (ex. Twisted stress) should not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- It is suggested to attach a transparent protective plate to the surface in order to protect the polarizer. It should have sufficient strength in order to the resist external force.
- The housing should adopt radiation structure to satisfy the temperature specification.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. Never rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer

Operating

- The spike noise causes the mis-operation of circuits. It should be within the ±200mV level (Over and under shoot voltage)
- Response time depends on the temperature.(In lower temperature, it becomes longer.)
- Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- When fixed patterns are displayed for a long time, remnant image is likely to occur.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference

Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

Storage

When storing modules as spares for a long time, the following precautions are necessary.

- Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

Protection Film

- When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt tore main on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.
- When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

Transportation

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.