



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT068DNNFWU-NEA

LCD Module User Manual

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Rev.	Descriptions	Release Date
0.1	Preliminary release	2017-06-21

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1. General Specification

Signal Interface :	LVDS (18bit)
Display Technology :	a-Si
Display Mode :	Transmissive / Normal White
Screen Size(Diagonal) :	6.8"
Outline Dimension :	195.0 x 69.6x 17.1 (mm) (see attached drawing for details)
Active Area :	163.92 x 55.44 (mm)
Number of dots :	1366 x3(RGB)x 480
Pixel Pitch :	0.12mm(H) x 0.1155mm(V)
Pixel Configuration :	RGB Stripe
Backlight :	White LED
Surface Treatment :	Glare Treatment
Viewing Direction :	6 o'clock(Gray scale Inversion) (*1) 12 o'clock (*2)
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

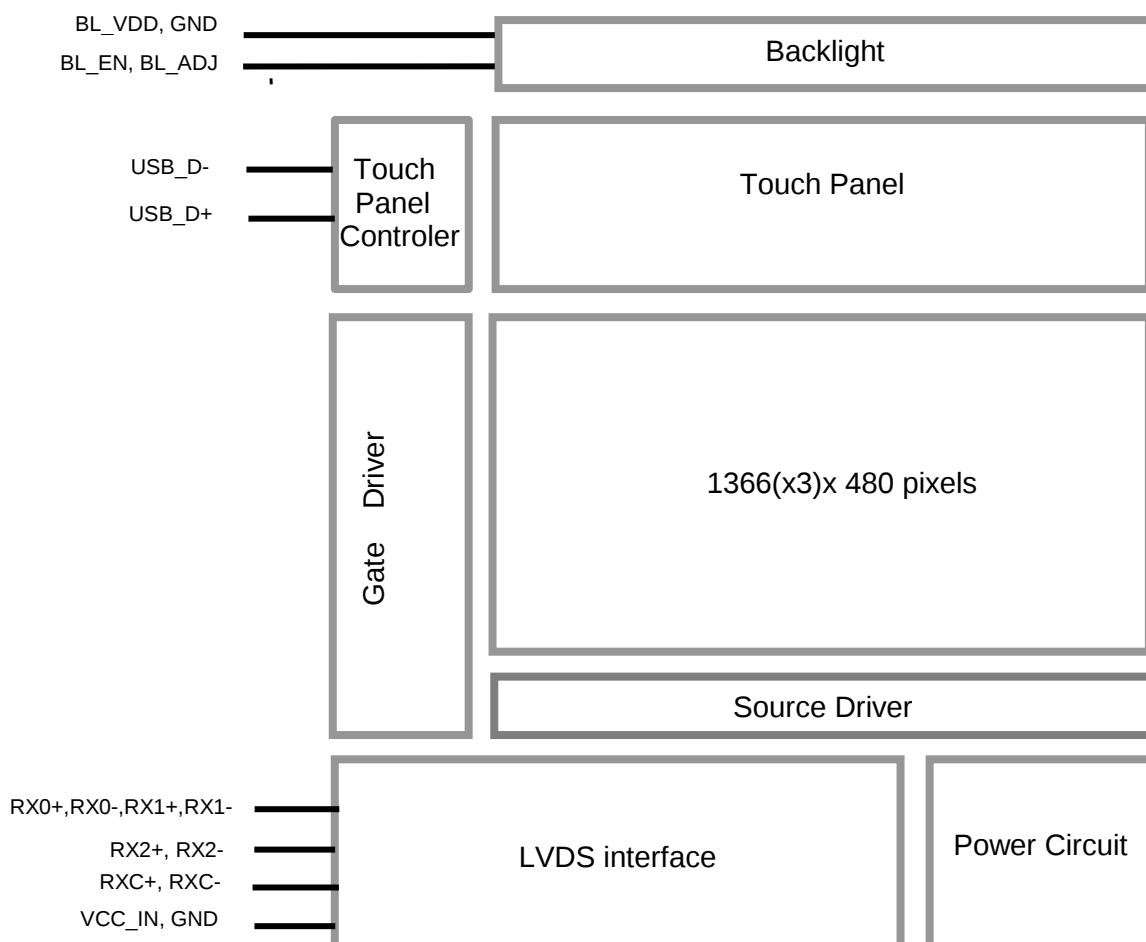
Note:

*1. For saturated color display content (eg. pure-red, pure-green, pure-blue or pure-colors -combinations).

*2. For “color scales” display content.

*3. Color tone may slightly change by temperature and driving condition.

2. Block Diagram



3. Terminal Function

3.1 K1 LVDS Terminal

Pin No.	Pin Name	IO	Descriptions
1	NC	-	No connection
2	NC	-	No connection
3	NC	-	No connection
4	NC	-	No connection
5	GND	Power	Ground
6	RXC+	Input	LVDS receiver negative signal clock
7	RXC-	Input	LVDS receiver positive signal clock
8	GND	Power	Ground
9	RX2+	Input	LVDS receiver negative signal channel 2
10	RX2-	Input	LVDS receiver positive signal channel 2
11	GND	Power	Ground
12	RX1+	Input	LVDS receiver negative signal channel 1
13	RX1-	Input	LVDS receiver positive signal channel 1
14	GND	Power	Ground
15	RX0+	Input	LVDS receiver negative signal channel 0
16	RX0-	Input	LVDS receiver positive signal channel 0
17	NC	-	No connection
18	NC	-	No connection
19	VCC_IN	Power	Positive Power Supply(3.3V)
20	VCC_IN		

3.2 K2 BackLight Connector

Pin No.	Pin Name	IO	Descriptions
1	BL_VDD	Power	Positive Power Supply(12V)
2	BL_ADJ	Input	Backlight dimming control PWM may be used to adjust the output brightness BL_ADJ=Hi,100% Drive BL_ADJ=Lo,0% Drive
3	BL_EN	Input	Backlight Driver Control BLON=Hi, Backlight Driving Booster enable BLON=Lo, Backlight Driving Booster disable
4	GND	Power	Power Supply GND (0V)

3.3 K3 Host Interface Terminal

1	GND	Power	Power Supply GND (0V)
2	USB_VDD	Power	Positive Power Supply(5V)
3	GND	Power	Power Supply GND (0V)
4	USB_D+	I/O	USB D+ signal
5	USB_D-	I/O	USB D- signal
6~10	NC	-	No connection

Note1.USB:Full Speed 12MHz bps

4. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Power Supply voltage	VCC_IN	-0.3	+3.6	V	
Backlight Supply voltage	BL_VDD	-0.3	+12.5	V	
USB Supply voltage	USB_VDD	-0.3	+5.5	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°C
- *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

Top=25°C, VCC_IN =3.3V ,GND=0V

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage	VCC_IN	3.0	3.3	3.6	V	
VCC Power Consumption	I _{VCC-IN}	-	180	450	mA	

5.2 LED Backlight Circuit Characteristics

BL_GND=0V, T_{OP}=25°C

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
Operating Voltage	BL_VDD	11.5	12.0	12.5	V	
Input High Voltage	V _{DDH}	3.0	-	BL_VDD	V	BL_EN, BL_ADJ
Input Low Voltage	V _{DDL}	BL_GND	-	0.3	V	BL_EN, BL_ADJ
Backlight Forward Current	I _{BLA}	-	185	450	mA	

Cautions:

Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.

Note:

- *1: BL_EN=Hi, BL_ADJ=Hi;
- *2: Recommended BL_ADJ PWM Freq. is 3kHz
- *3: Terminal circuit (Fig.1) :

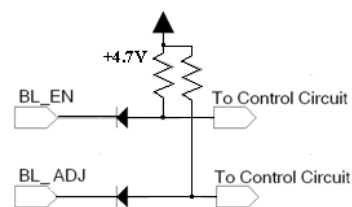


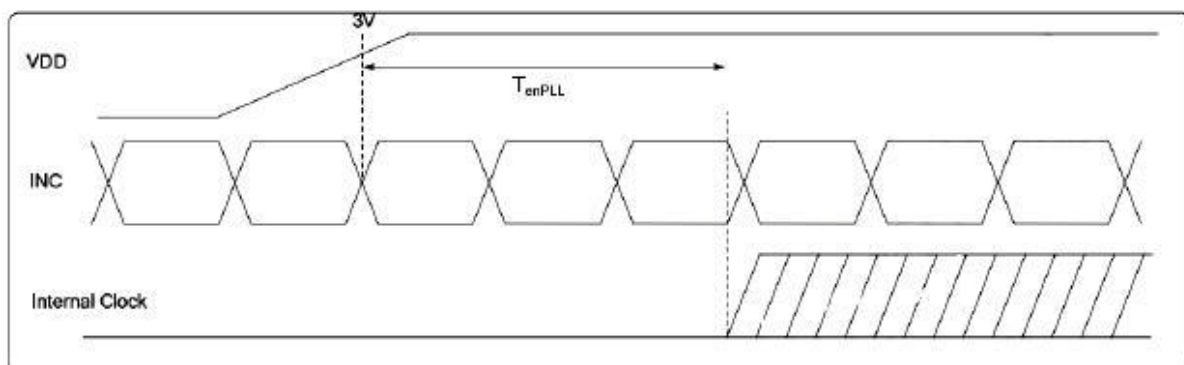
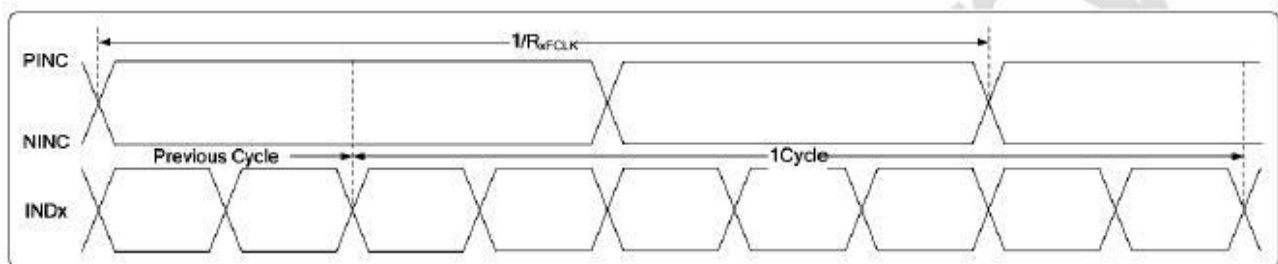
Fig.1 Terminal circuit

6. AC Characteristics

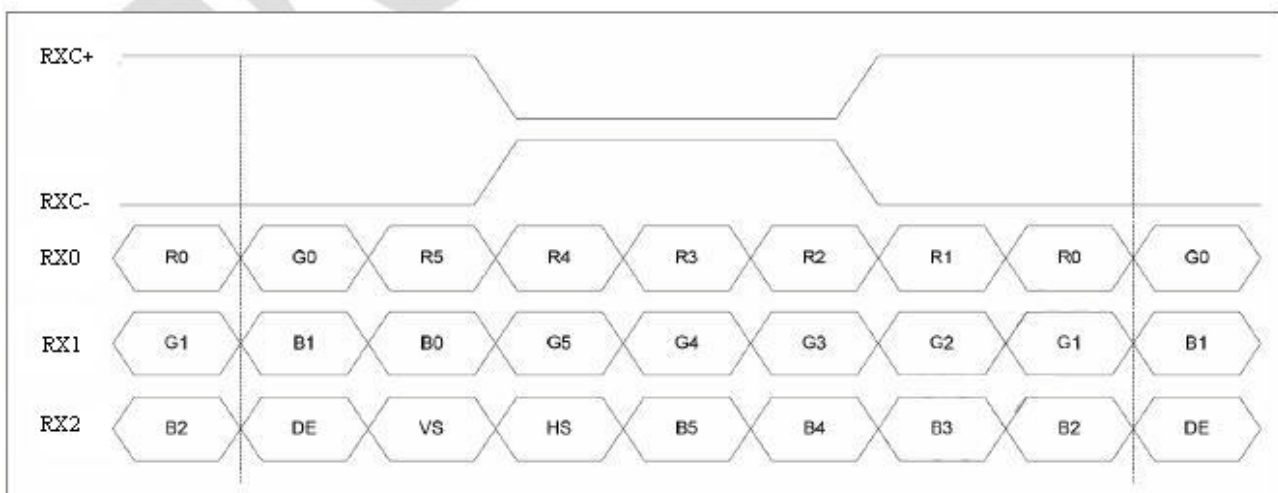
6.1 LVDS Timing Characteristic

Items	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Clock frequency	RxCLK	20	-	81	MHz	-
Input data skew margin	T _{RSKM}	300	-	-	ps	V _{ID} =400mV R _{XVCM} =1.2V R _{XFCLK} =81MHz
Clock high time	T _{LVCH}	-	$4/(7 \cdot R_{XFCLK})$	-	ns	
Clock low time	T _{LVCL}	-	$3/(7 \cdot R_{XFCLK})$	-	ns	
PLL wake-up time	T _{enPLL}	-	-	150	us	

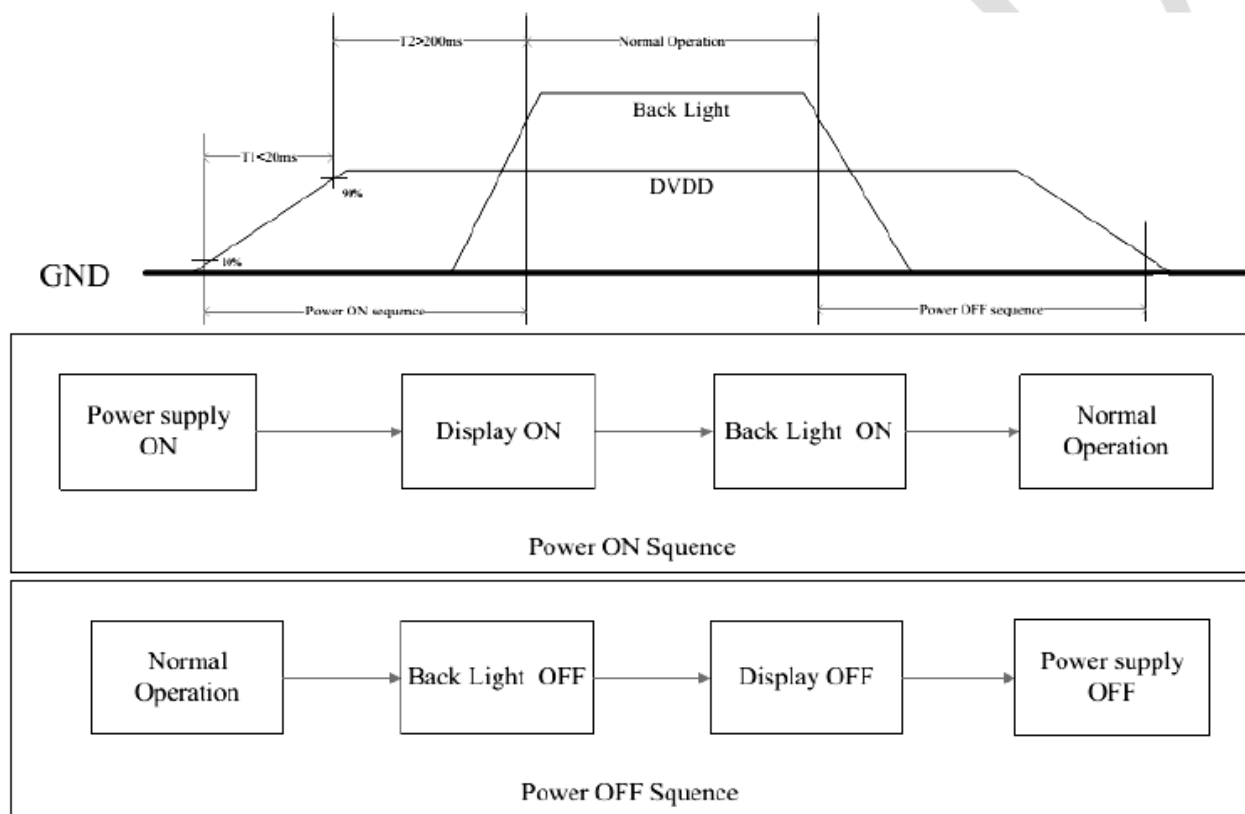
Input Clock and Data timing Diagram:



18 bits LVDS input



6.2 Power ON/OFF Sequence



7. Optical Characteristics

Test Conditions:

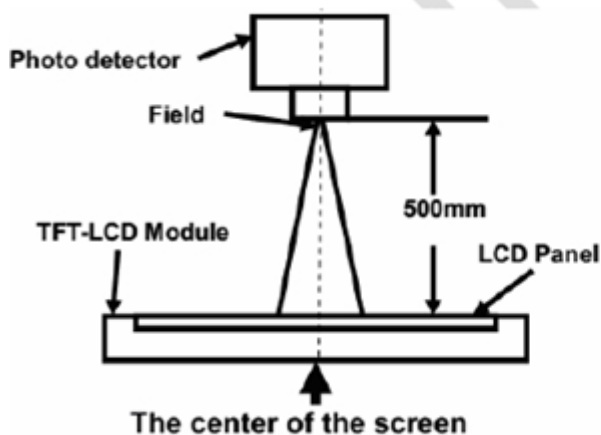
Top=25°C, BL-VDD =12V ,GND=0V

Items	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remark
View Angles	θT	$CR \geq 10$	40	50		Degree	(*2)
	θB		60	70			
	θL		60	70			
	θR		60	70			
Contrast Ratio	CR	$\theta=0^\circ$	400	500	-		(*1),(*3)
Response Time	T_{ON}	25°C	-	20	50	ms	(*1), (*4)
	T_{OFF}						
Chromaticity	White	x	0.258	0.308	0.358		(*1),(*5)
		y	0.275	0.325	0.375		
	Red	x	0.544	0.594	0.644		
		y	0.279	0.329	0.379		
	Green	x	0.304	0.354	0.404		
		y	0.518	0.568	0.618		
	Blue	x	0.101	0.151	0.201		
		y	0.054	0.104	0.154		
Uniformity	U		70	75	-	%	(*1),(* 6)
NTSC			45	50	-	%	(*5)
Luminance	L		-	400	-	cd/m ²	(*1), (*7)

Note:

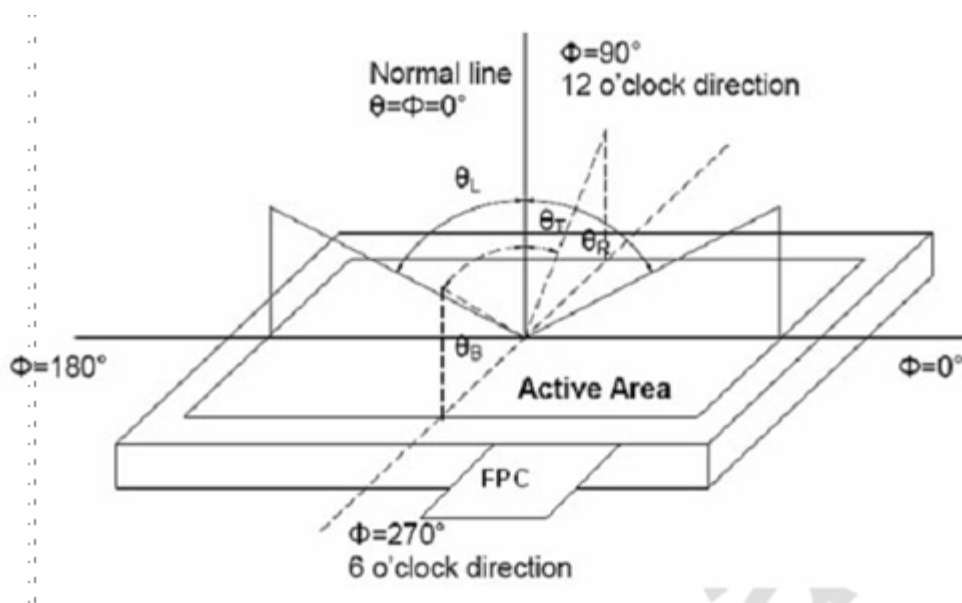
*1. Definition of optical measurement system.

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.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Lum Uniformity		
Chromaticity		
Response Time	LCD5200	-

*2. Definition of viewing angle range and measurement system. viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)



*3. Definition of contrast ratio

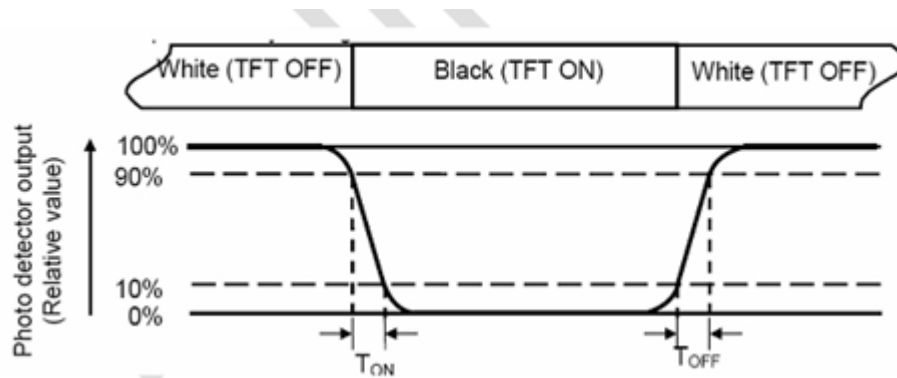
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

"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

*4. Definition of Response time



*5. Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

*6. Definition of Luminance Uniformity

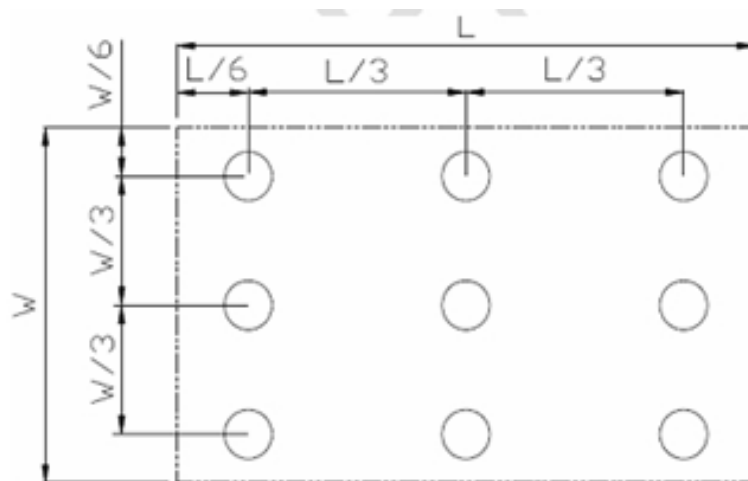
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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

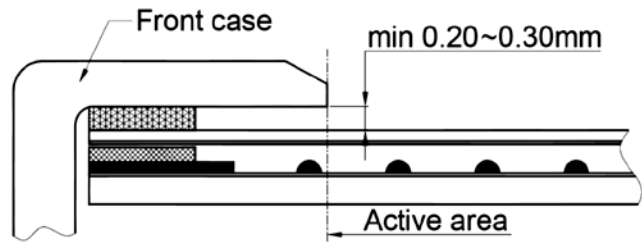
*7. Definition of Luminance:

Measure the luminance of white state at center point.

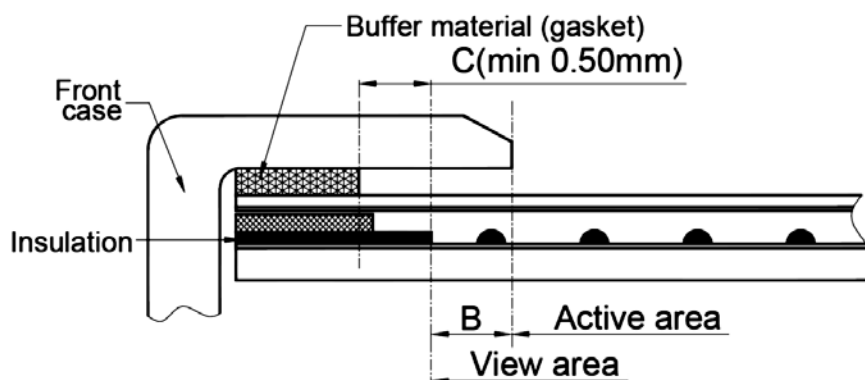


8. Touch panel Design Precautions

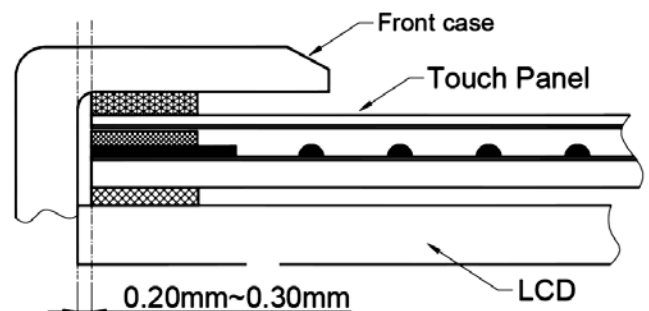
1. It should prevent front case touching the touch panel Active Area (A.A.) to prevent abnormal touch.
It should left gab (e.g. 0.2~0.3mm) in between.



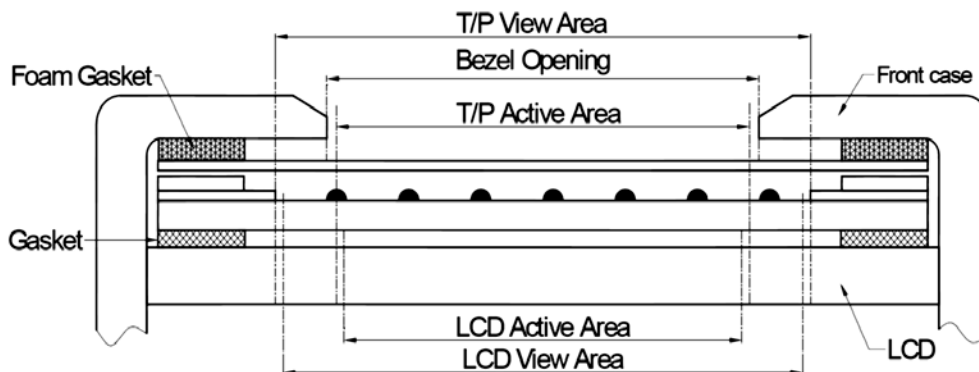
2. Outer case design should take care about the area outside the A.A.
Those areas contain circuit wires which is having different thickness. Touching those areas could de-form the ITO film. As a result case the ITO cold be damaged and shorten its lifetime.
It is suggested to protect those areas with gasket (between the front case and the touch panel).
The suggested figures are $B \geq 0.50\text{mm}$; $C \geq 0.50\text{mm}$.



3. The front case side wall should keep space (e.g. 0.2 ~ 0.3mm) from the touch panel.



4. In general design,
touch panel V.A. should be bigger than the LCD V.A.
and touch panel A.A. should be bigger than the LCD A.A.



9. Precautions for Use of LCD Modules

9.1 Handling Precautions

- 9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- 9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcoholSolvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 9.1.6 Do not attempt to disassemble the LCD Module.
- 9.1.7 If the logic circuit power is off, do not apply the input signals.
- 9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 9.1.8.1 Be sure to ground the body when handling the LCD Modules.
 - 9.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.
 - 9.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 9.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

9.2 Storage precautions

- 9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:
Temperature : 0℃ ~ 40℃ Relatively humidity: ≤80%
- 9.2.3 The LCD modules sho

9.3 Transportation Precautions

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