



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT068DNNFWU

LCD Module User Manual

Prepared by: Liusanyong Date: 2018-03-06	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Release Date
0.1	- Preliminary	2015-05-15
0.2	- Revise as 18 bits LVDS I/F	2016-01-19
0.3	-Update 5.1	2018-03-06

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1. General Specification

Signal Interface :	18 bits LVDS (VESA)
Display Technology :	a-Si
Display Mode :	Transmissive with Normally White
Screen Size :	6.8 inch
Outline Dimension :	175.0x 68.3x 5.4mm ,exclude FPC (see outline drawing for details)
Active Area :	163.92mmx 55.44mm
Number of dots :	1366x 3 (RGB) x 480
Dot Pitch :	0.12mm(H)x 0.1155mm(V)
Pixel Configuration :	R.G.B. Vertical Stripe
Backlight :	White LED
Viewing Direction :	6 o'clock (Gray scale Inversion) (*1) 12 o'clock (*2)
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

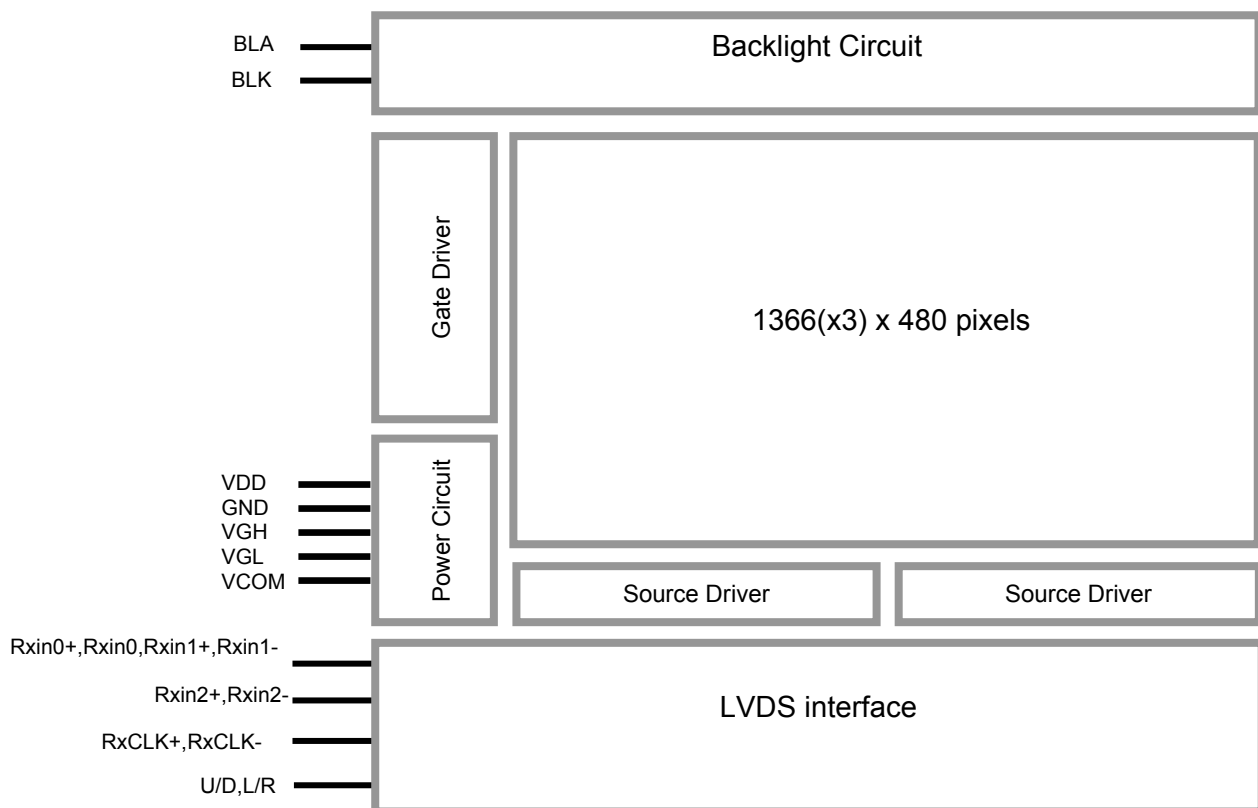
Note:

*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. Input/Output Terminals

3.1 TFT Terminals

Pin No.	Pin Name	I/O	Descriptions
1	VCOM	Power	Common Voltage
2	VDD	Power	Power Supply
3			
4	GND	Power	Ground
5	Rxin0-	Input	LVDS receiver signal channel 0, LVDS Differential Data Input (R0, R1 , R2, R3, R4, R5, G0)
6	Rxin0+	Input	
7	GND	Power	Ground
8	Rxin 1-	Input	LVDS receiver signal channel 1,LVDS Differential Data Input (G1~G5, B0, B1)
9	Rxin 1+	Input	
10	GND	Power	Ground
11	Rxin 2-	Input	LVDS receiver signal channel 2, LVDS Differential Data Input (B2~B5, HS, VS, DE)
12	Rxin 2+	Input	
13	GND	Power	Ground
14	RxCLK-	Input	LVDS Differential Clock Input
15	RxCLK+	Input	
16	GND	Power	Ground
17	NC	-	No connection
18	NC	-	
19	GND	Power	Ground
20	AVDD	Power	Power for Analog Circuit
21	GND	Power	Ground
22	L/R	Input	Source Driver Left/Right scan setting(*1)
23	VGL	Power	Gate OFF Voltage
24	U/D	Input	Gate Driver Up/down scan setting(*1)
25	VGH	Power	Gate ON Voltage
26	NC	-	No connection
27	BLK	Power	LED Cathode
28			
29	BLA		LED Anode
30			

Note:

*1.Scanning direction

Scan Control Input		Descriptions
U/D	L/R	
GND	VDD	Up to Down, Left to Right
VDD	GND	Down to Up, Right to Left

4. Absolute Maximum Ratings

GND=0V, T_a=25°C

Items	Symbol	Min.	Max.	Unit	Remark
Power Voltage	VDD	-0.5	3.6	V	
	AVDD	-0.5	14.5	V	
	VGH	-0.3	36	V	
	VGL	VGH-36	0.3	V	
Backlight Forward Current	I _{BLA}	-	250	mA	
Operating Temperature	T _{OP}	-20	70	°C	
Storage Temperature	T _{ST}	-30	80	°C	

Cautions:

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

VDD=3.3V, GND=0V, T_a=25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Analog Supply Voltage	AVDD	10.5	11.0	11.5	V	
Gate On Voltage	VGH	23.5	24.0	24.5	V	
Gate Off Voltage	VGL	-7.5	-7.0	-6.5	V	
Common Electrode Driving Signal	VCOM	3.9	4.3	4.7	V	
Digital Supply Current	I _{VDD}	-	24	-	mA	VDD=3.3V
Analog Supply Current	I _{AVDD}	-	15	-	mA	AVDD=11V
Gate On Current	I _{VGH}	-	0.28	-	mA	VGH=24V
Gate Off Current	I _{VGL}	-	0.28	-	mA	VGL=-7V
VCOM Current	I _{vcom}	-	0.002	-	mA	VCOM=4.3V

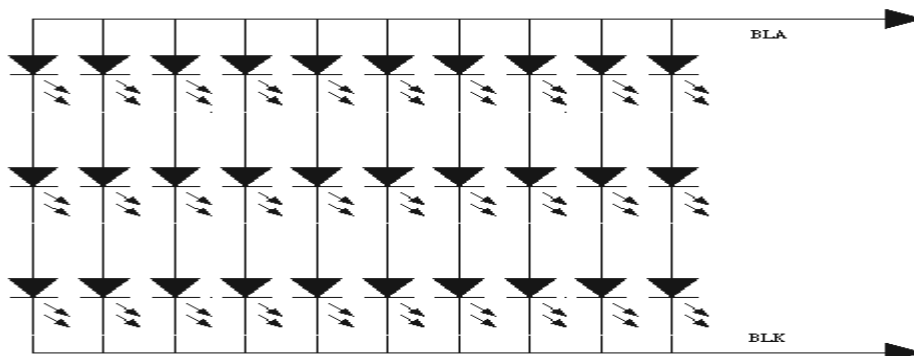
5.2 LED Backlight Circuit Characteristics

T_a=25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Forward Current	I _{BLA}	-	200	250	mA	*1, *2
Forward Voltage	V _{BLA}	9.0	9.6	10.2	V	
Operating Life Time	-	-	50000	-	Hrs	

Note:

1. Exceeding the recommended Condition could cause substantial damage to the touch panel and shorten its lifetime.
2. Current Driver suggested.



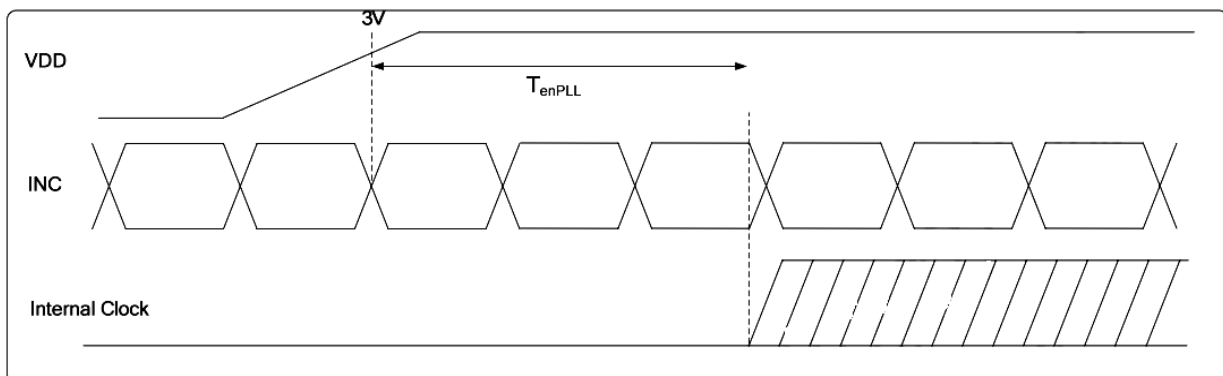
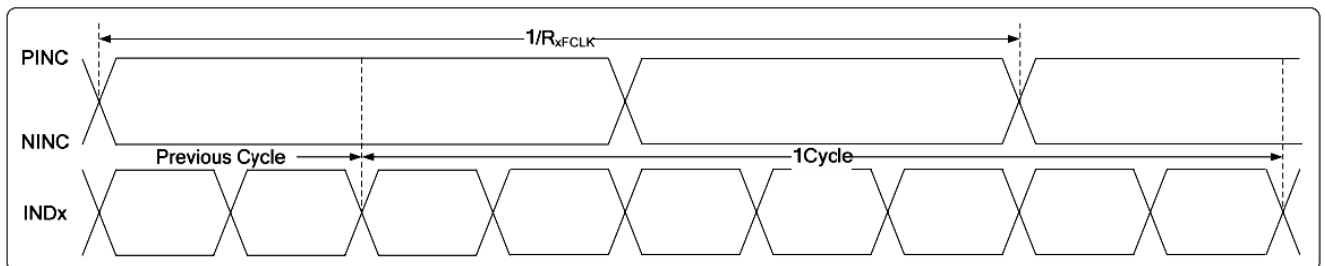
6. AC Characteristics

6.1 LVDS Timing Characteristics

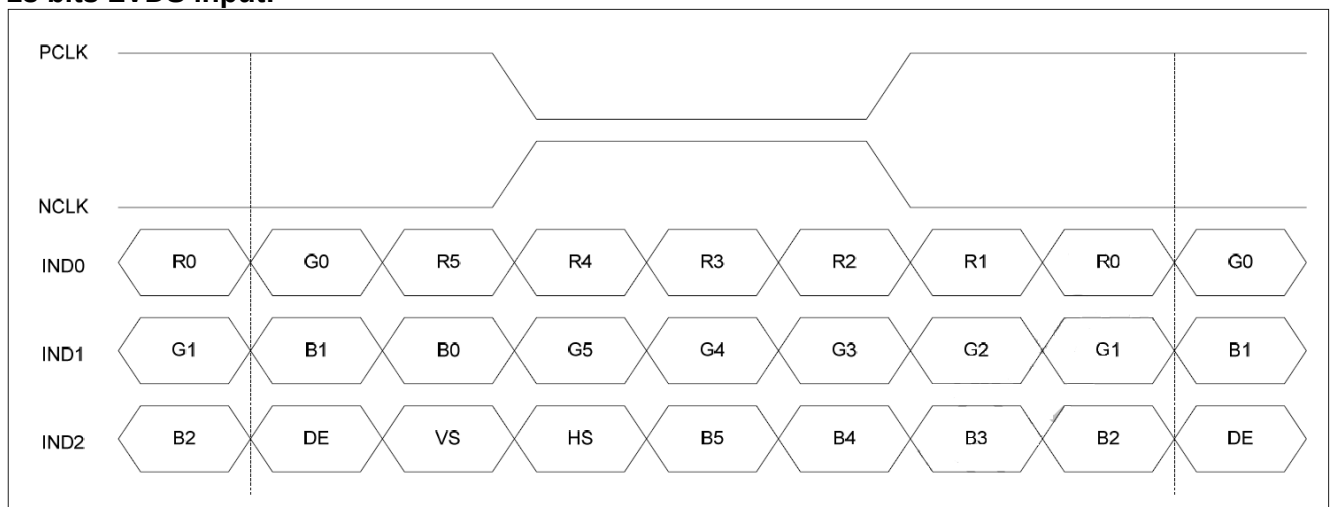
VDD=3.3V, AVDD= TBD V, GND=0V, Ta=25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Clock frequency	R_{XCLK}	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 Input Timing Table

(1).DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	68	75	80.9	MHz
Horizontal Display Area	thd	1366			DCLK
HSD Period	th	1456	1550	1596	DCLK
HSD Blanking	thbp+ thfp	90	184	230	DCLK
Vertical Display Area	tvd	768			th
VSD Period	tvbp	778	806	845	th
VSD Blanking	tvbp+tvfp	10	38	77	th

(2).HV mode

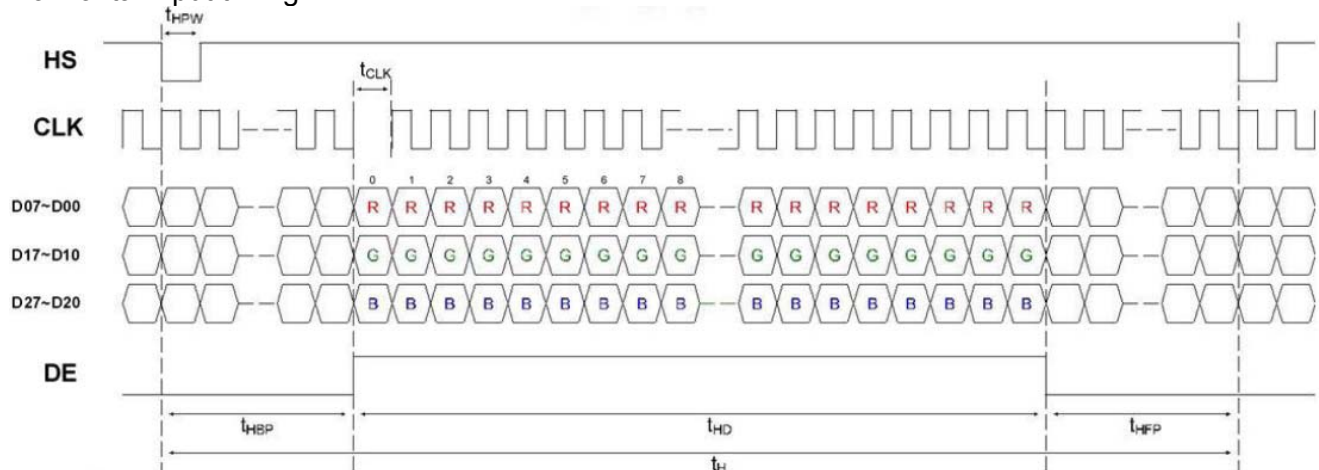
Horizontal Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	69.6	75	80.9	MHz
Horizontal Display Area	thd	1366			DCLK
HSD Period	th	1466	1550	1596	DCLK
HSD Pulse Width	thpw	1	-	40	DCLK
HSD Back Porch	thbp	88			DCLK
HSD Front Porch	thfp	12	96	142	DCLK

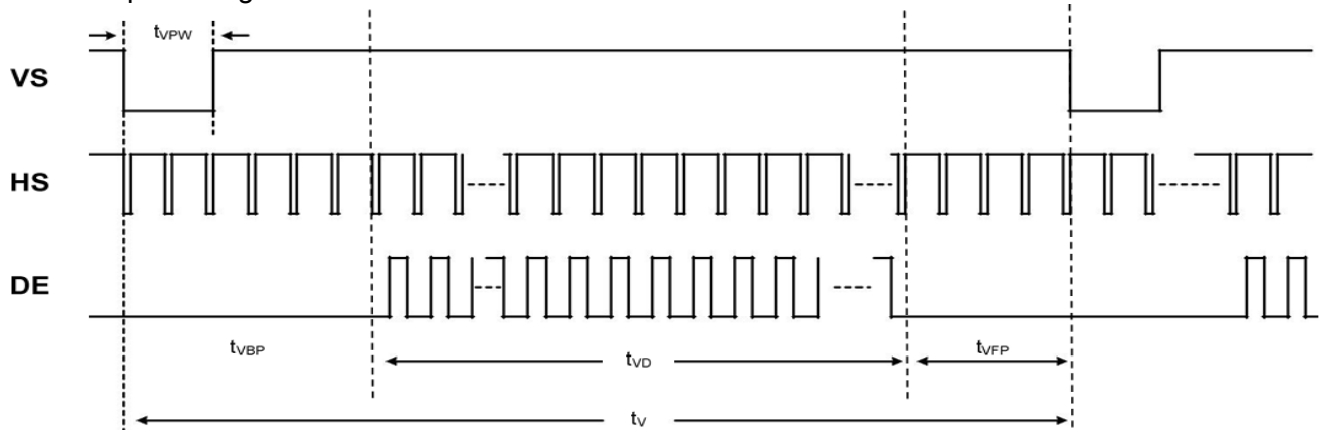
Vertical Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	768			th
VSD Period	tv	792	806	840	th
VSD Pulse Width	tvpw	1	-	20	th
VSD Back Porch	tvbp	23			th
VSD Front Porch	tvfp	1	15	49	th

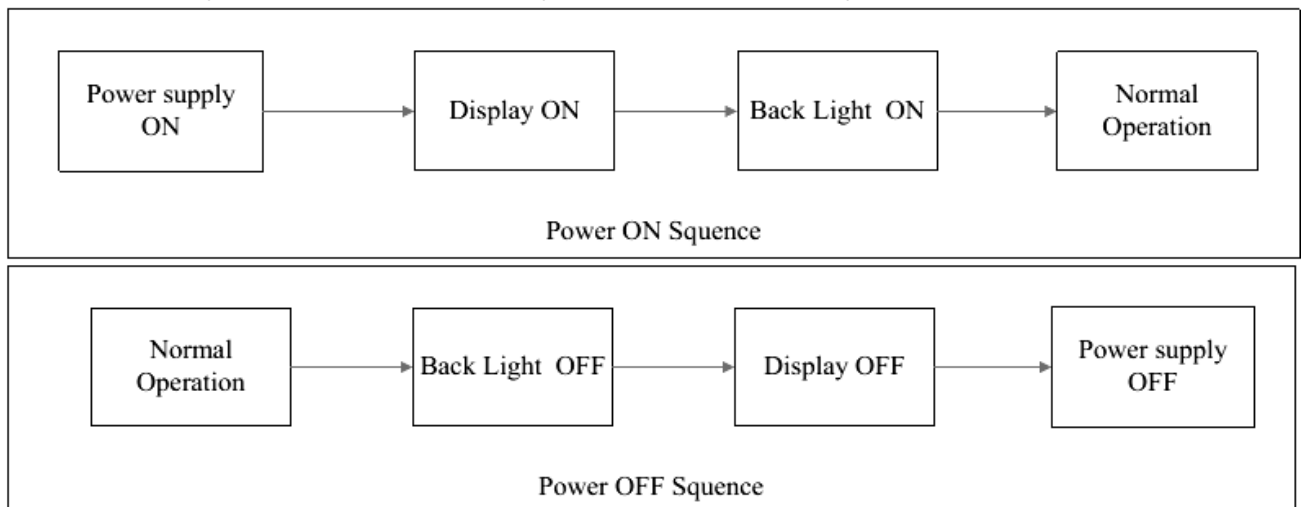
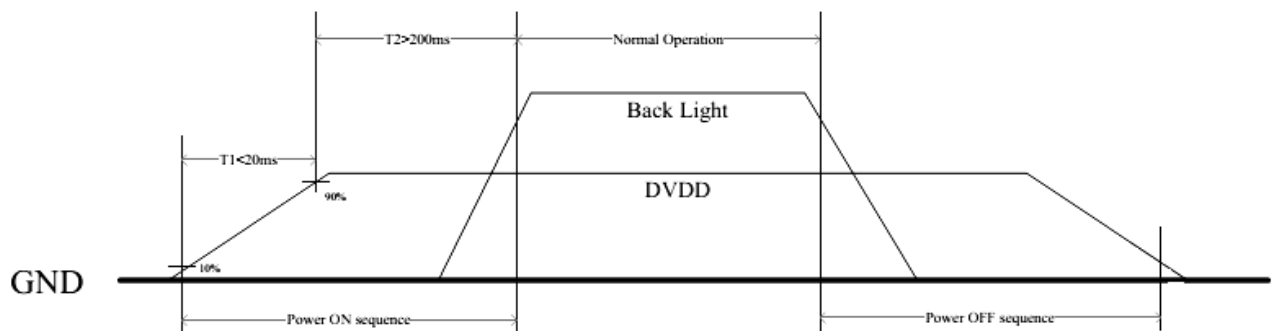
Horizontal input timing



Vertical input timing



6.3 POWER ON/OFF SEQUENCE



7. Optical Characteristics

Test Conditions:

1. $I_{BLA} = 200 \text{ mA}$, $V_{BLA} = 9.6 \text{ V}$ and the ambient temperature is 25°C .
2. The test systems refer to Note 1 and Note 2.

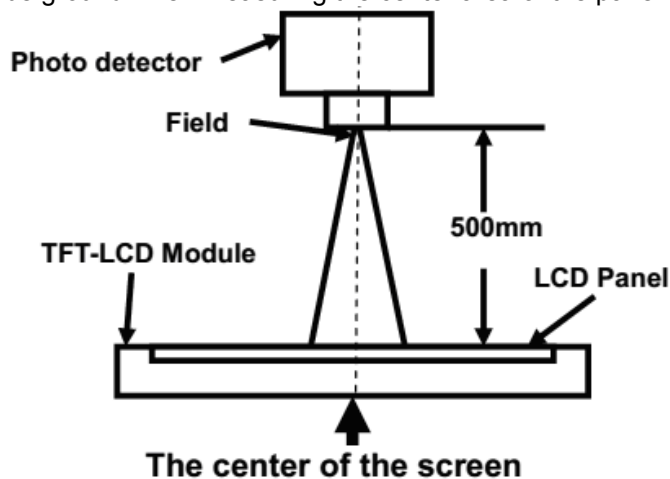
$T_a = 25^\circ\text{C}$

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		-	500	-	cd/m^2	(*1), (*7)

Note:

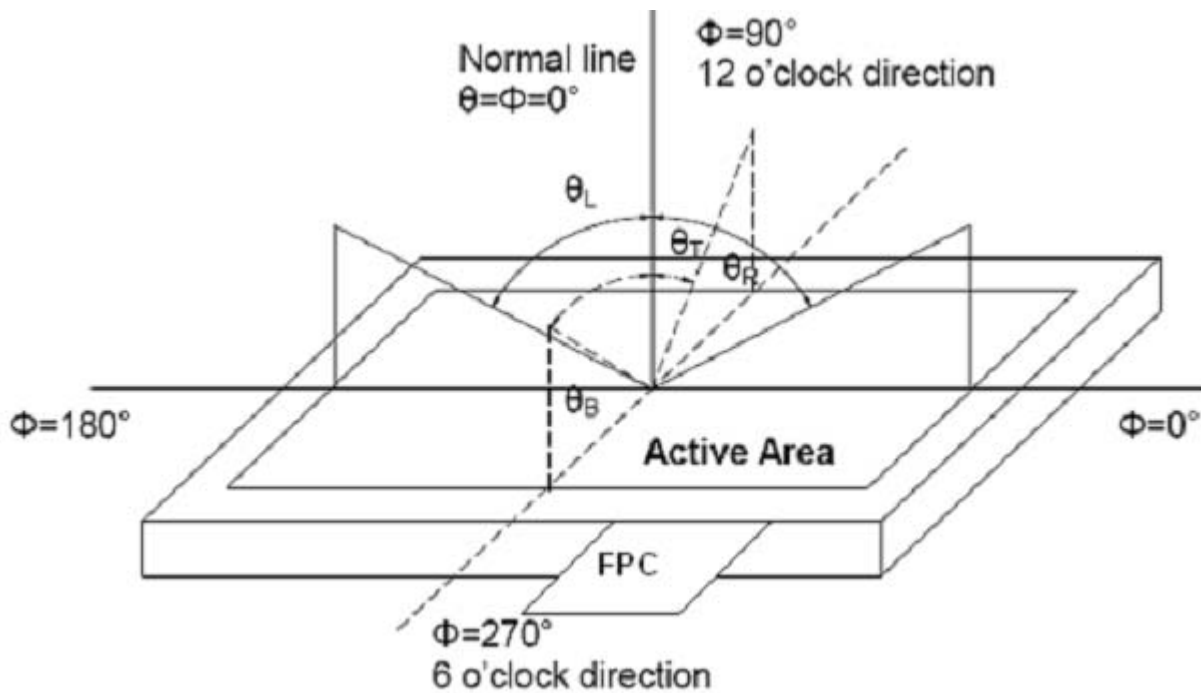
*1. Definition of optical measurement system.

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

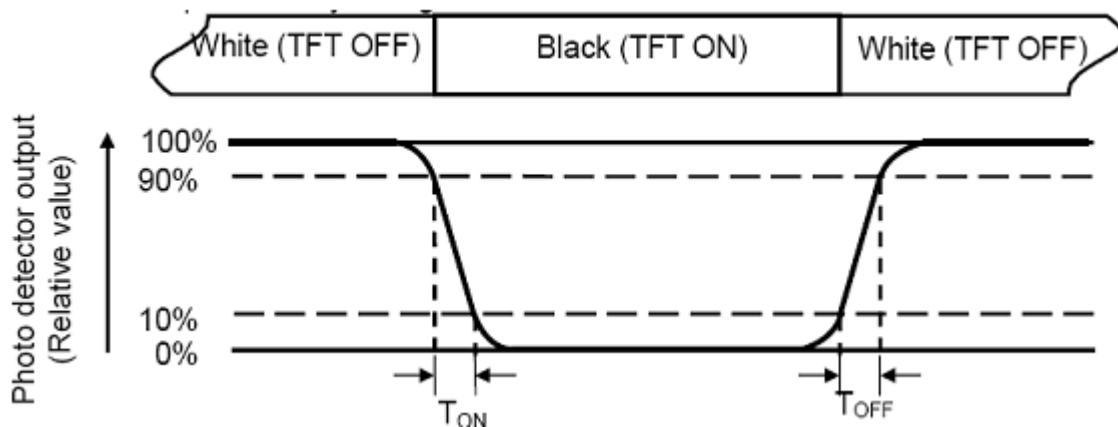
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

"White state ": The state is that the LCD should drive by V_{white} .

"Black state": The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

*4. Definition of Response time



*5. Definition of color chromaticity (CIE1931)

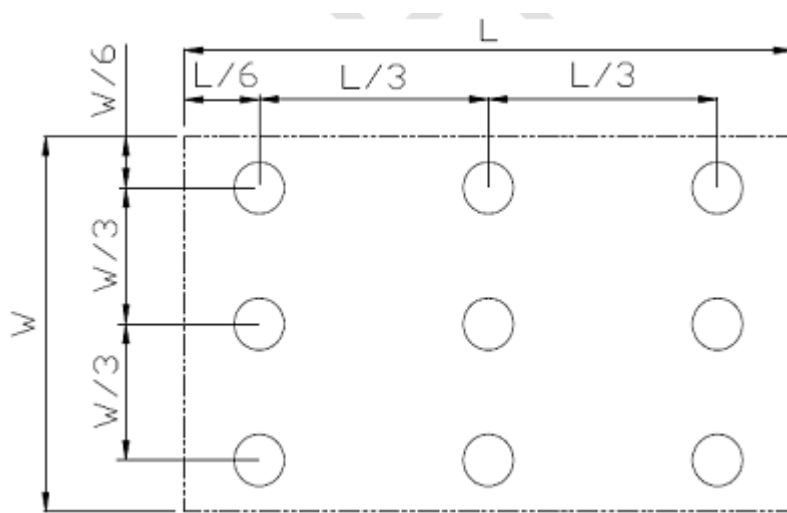
Color coordinates measured at center point of LCD.

*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.

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

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



*7. Definition of Luminance:

Measure the luminance of white state at center point.

8. Precautions for Use of LCD Modules

8.1 Handling Precautions

- 8.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 8.1.2 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.
- 8.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 8.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 8.1.5 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
- 8.1.6 Do not attempt to disassemble the LCD Module.
- 8.1.7 If the logic circuit power is off, do not apply the input signals.
- 8.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 8.1.8.1 Be sure to ground the body when handling the LCD Modules.
 - 8.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.
 - 8.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 8.1.8.4 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.

8.2 Storage precautions

- 8.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 8.2.2 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%
- 8.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

8.3 Transportation Precautions

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