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

LMT080DIEFWU-3

LCD Module User Manual

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Yu		
Date: 2018-07-20	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Preliminary release	2017-07-10
0.2	Update section 6.1	2018-07-20

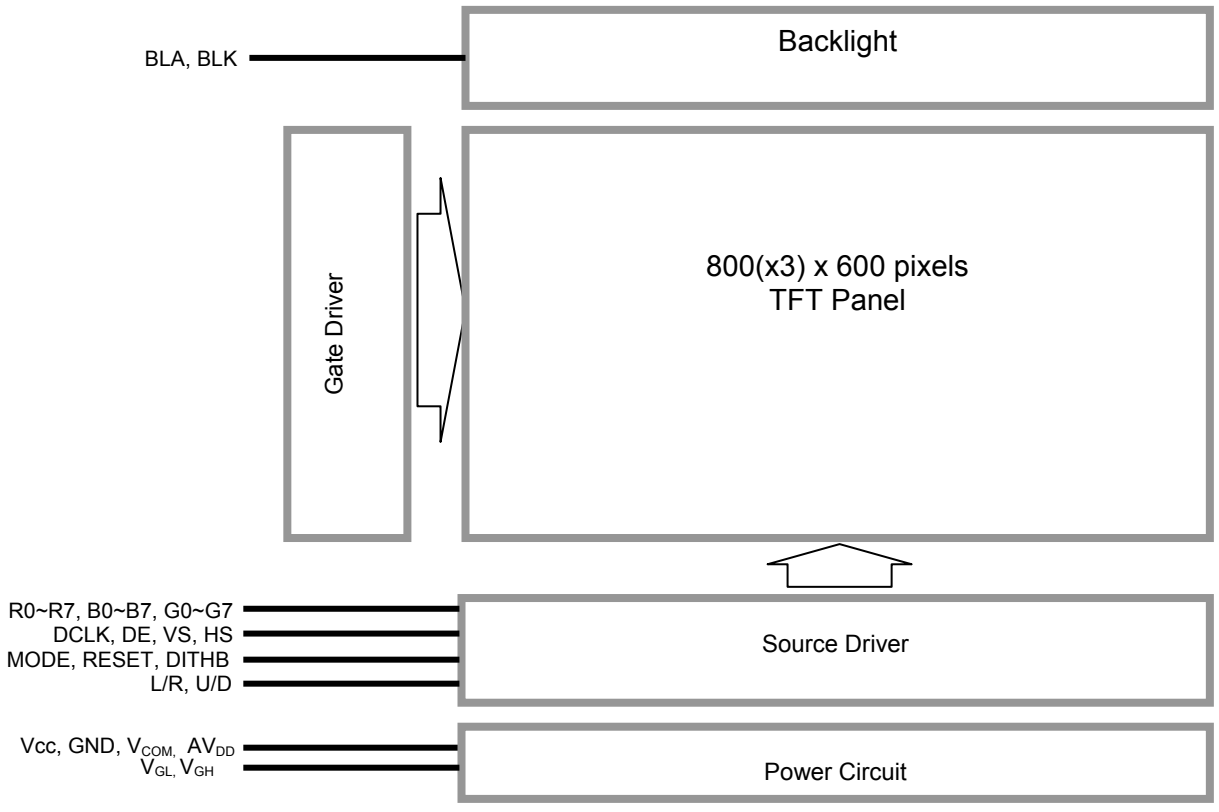
Table of Content

1. General Specification

Signal Interface :	Digital 24-bits RGB
Display Technology :	a-Si TFT active matrix
Display Mode :	Transmissive / Normal White
Screen Size(Diagonal) :	8.0”
Outline Dimension :	183.0 x 141.0 x 5.6 (mm) (see attached drawing for details)
Active Area :	162.0 x 121.5 (mm)
Number of dots :	800 x 3 (RGB) x 600
Pixel Pitch :	0.2025 x 0.2025 (mm)
Pixel Configuration :	RGB Stripe
Backlight :	LEDs
Surface Treatment :	Anti-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 TFT Input Terminal

Pin No.	Pin Name	I/O	Descriptions
1 : 4	NC	-	No Connection
5	GND	Power	Power GND (0V)
6	V_{COM}	Input	Common voltage
7	Vcc	Power	Power for Digital Circuit
8	MODE	Input	DE/SYNC mode select (*1)
9	DE	Input	Data input enable
10	VS	Input	Vertical Sync Input
11	HS	Input	Horizontal Sync Input
12 : 19	B7 : B0	Input	8bit Data for Blue
20 : 27	G7 : G0	Input	8bit Data for Green
28 : 35	R7 : R0	Input	8bit Data for Red
36	GND	Power	Power GND (0V)
37	DCLK	Input	Sample clock(*2)
38	GND	Power	Power GND (0V)
39	L/R	Input	Left / right selection (*3)
40	U/D	Input	Up/down selection (*3)
41	V_{GH}	Power	Gate ON Voltage
42	V_{GL}	Power	Gate OFF Voltage
43	AV_{DD}	Power	Power for Analog Circuit
44	RESET	Input	Global reset pin (*4)
45	NC	-	No connection
46	V_{COM}	Input	Common Voltage
47	DITHB	Input	Dithering function DITHB=0,Disable internal dithering function. DITHB=1,Enable internal dithering function.
48	GND	Power	Power GND (0V)
49 50	NC NC	-	No connection

Note:

* 1: When select DE mode, MODE="1".
  When select SYNC mode, MODE= "0".
* 2: Data shall be latched at the falling edge of DCLK.
* 3: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	Vcc	Up to down, left to right
Vcc	GND	Down to up, right to left
GND	GND	Up to down, right to left
Vcc	Vcc	Down to up, left to right

*4: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

3.2 K2 (Backlight connector)

Pin No.	Pin Name	IO	Descriptions	Wire Color
1	BLA	Power	LED driving anode (high voltage)	Red
2	BLK	Power	LED driving cathode (low voltage)	White

4. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Power voltage	Vcc	-0.5	3.96	V	
	AV_{DD}	-0.5	14.85	V	
	V_{GH}	-0.3	+42	V	
	V_{GL}	V_{GH} -42	+0.3	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	Vcc	2.8	3.3	3.6	V	*2
	AV_{DD}	12.4	12.6	12.8	V	
	V_{GH}	20	22	24	V	
	V_{GL}	-7.4	-6.9	-6.4	V	
Input signal voltage	V_{COM}	4.05	4.1	4.15	V	
Input logic high voltage	V_{IH}	0.7Vcc	-	Vcc	V	*3
Input logic low voltage	V_{IL}	0	-	0.3Vcc	V	

Note:
*1.Be sure to apply VCC and VGL to the LCD first, and then apply VGH.
*2: VCC setting should match the signals output voltage (refer to Note 3) of customer's system board.
*3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

5.2 Current Consumption

Items	Symbol	Min.	Typ.	Max.	Unit	Remark
Current for Driver	I_{GH}	-	0.28	0.4	mA	V_{GH} = 22.0V
	I_{GL}	-	0.29	0.4	mA	V_{GL} = -7.0V
	I_{CC}	-	3.10	10	mA	V_{DD}=3.3V
	$I_{AV_{DD}}$	-	17.8	28	mA	AV_{DD}=12.5V

5.3 LED Backlight Circuit Characteristics

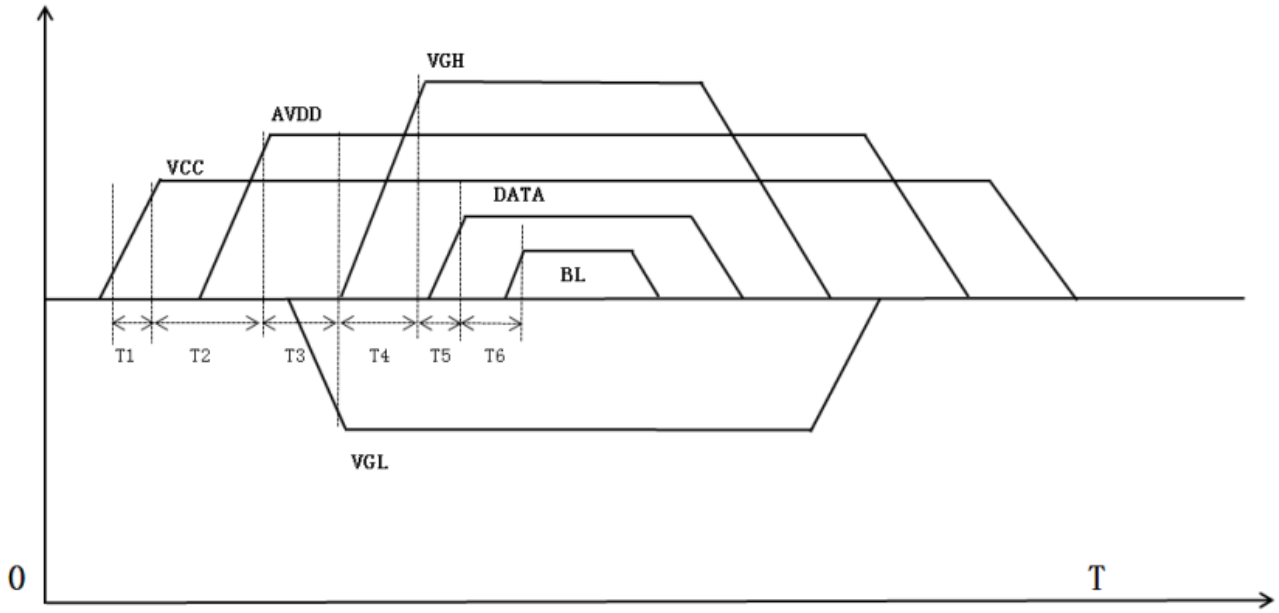
Top=25℃

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Voltage	Vf_{BLA}	9.0	9.6	10.3	V	If=180mA
Forward Current	If_{BLA}	-	180	225	mA	
Backlight Life Time	-	20,000	25,000	-	hr	If=180mA

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

5.4 Power on/off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC 3.3V rising time	T1	0	-	20	ms	
VCC to AVDD on time	T2	16.7	-	-	ms	
AVDD to VGL on time	T3	0	-	-	ms	
VGL to VGH on time	T4	0	-	-	ms	
VGH to DATA on time	T5	0	-	-	ms	
DATA to BL on time	T6	0	-	-	ms	



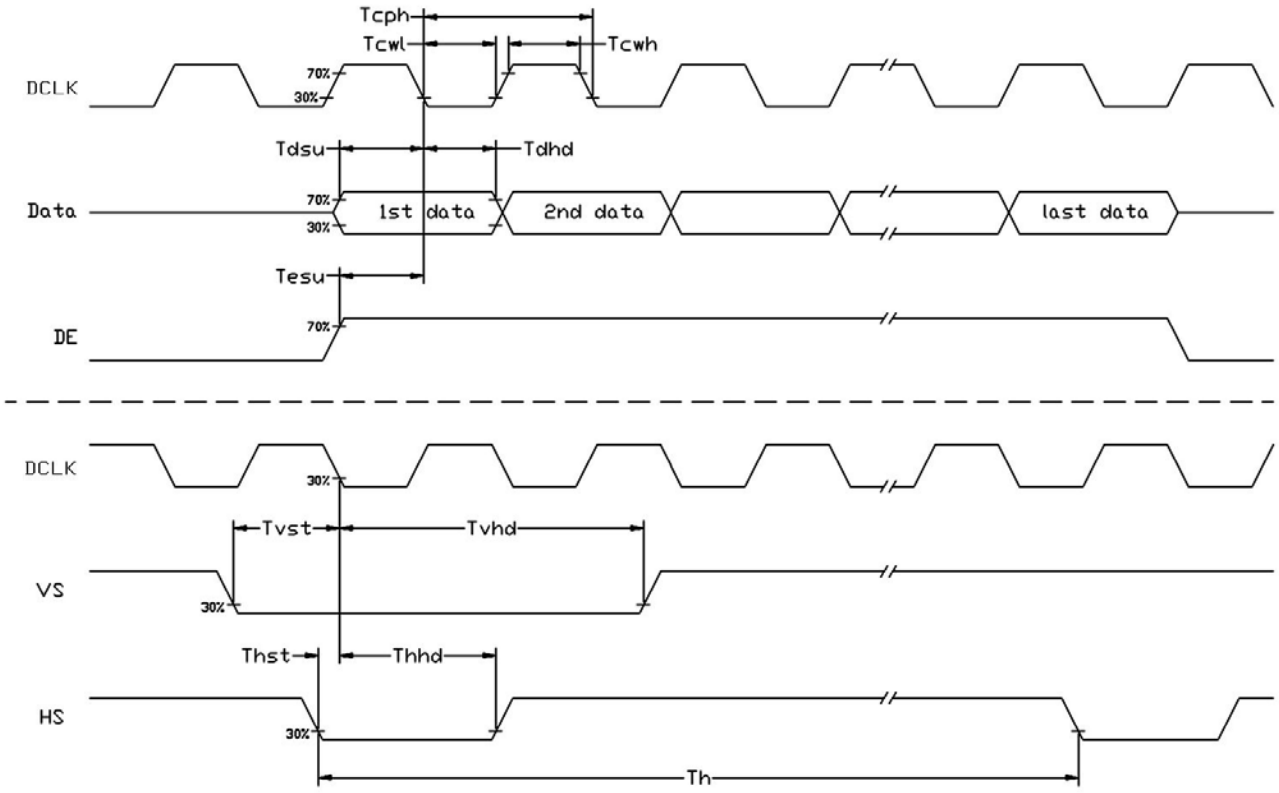
Note:
*1. Power on sequence: VCC➔AVDD➔VGL➔VGH➔DATA ON➔BACKLIGHT ON
*2. Power off sequence: BACKLIGHT OFF➔DATA OFF➔VGH➔VGL➔AVDD➔VCC
*3. When VCC turned on, the rising time T1 should less than 20ms.
*4. AVDD stable to VCC stable time T2 should better longer than 1 frame time.
*5. The power off sequence can be set according to power on settings.

6. AC Characteristics

6.1 Timing Characteristics

Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
VDD Power On Slew rate	TPOR	-	-	20	ms	From 0V to 90% VDD
DCLK Cycle Time	Tcph	14	-	-	ns	
DCLK Pulse Width	Tcw	40	50	60	%	
VSD Setup Time	Tvst	5	-	-	ns	
VSD Hold Time	Tvhd	5	-	-	ns	
HSD Setup Time	Thst	5	-	-	ns	
HSD Hold Time	Thhd	5	-	-	ns	
Data Setup Time	Tdsu	5	-	-	ns	Data to DCLK
Data Hold Time	Tdhd	5	-	-	ns	Data to DCLK
DE Setup Time	Tesu	5	-	-	ns	
DE Hold Time	Tehd	5	-	-	ns	

6.2 Input Clock and Data Timing Diagram



6.3 Recommended Timing Setting Of TCON

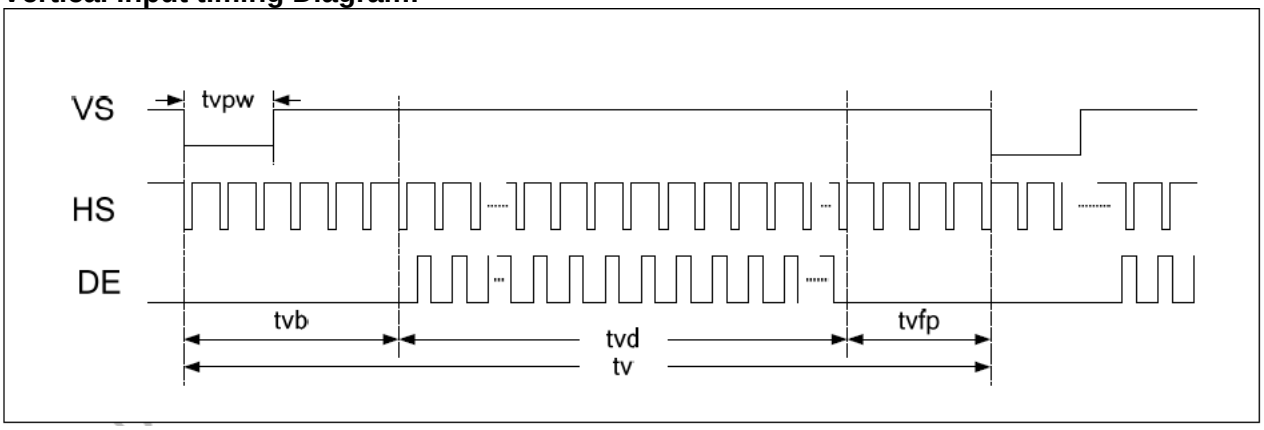
TCON (Embedded In Source IC) Input Timing (DCLK, HSD, VSD, DE)

VCC=3.3V, AVDD=12.6V, AGND=GND=0V, Ta=25℃

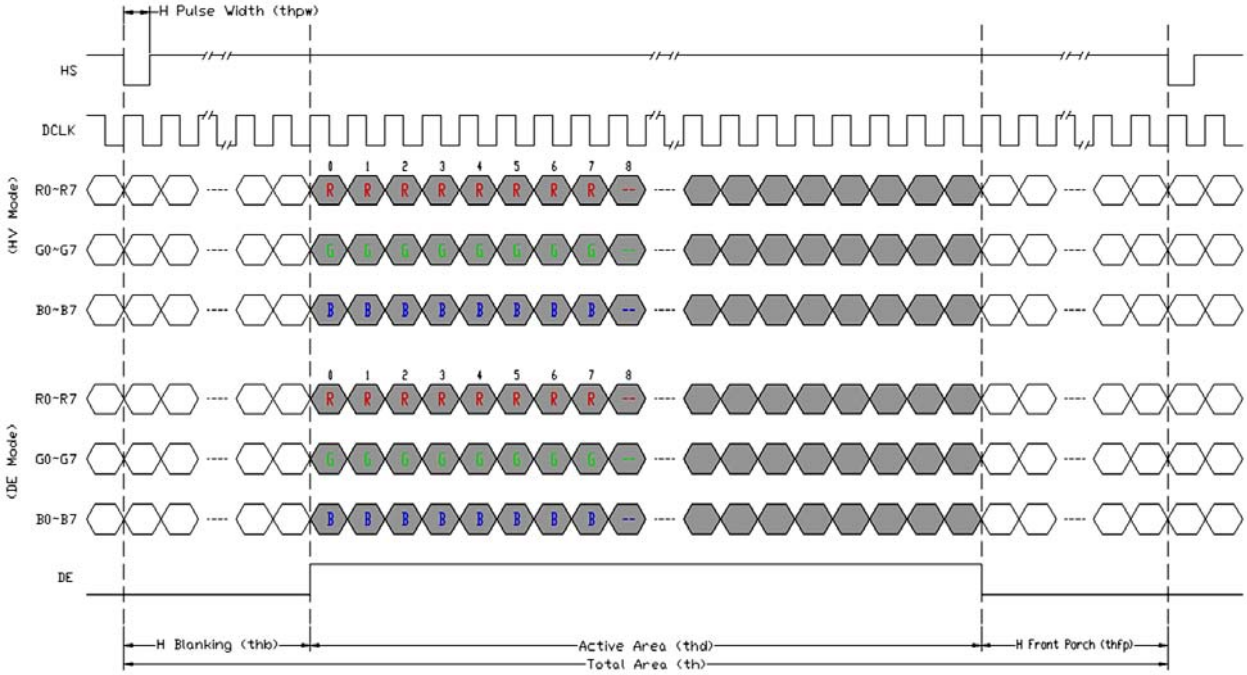
Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
DCLK	Fclk	34.5	39.6	50.4	MHZ	
	tclk	-	25.3	-	ns	
HSD	th	900	1000	1200	tclk	
	thd	-	800	-	tclk	
	thpw	1	-	40	tclk	
	thb	-	88	-	tclk	
	thfp	12	112	312	tclk	
VSD	tv	640	660	700	th	
	tvd	-	600	-	th	
	tvpw	1	-	20	th	
	tvb	-	39	-	th	
	tvfp	1	21	61	th	

Note: DE timing refer to HSD, VSD input timing.

Vertical input timing Diagram:



6.4 Horizontal input timing Diagram



Horizontal input timing diagram

7. Optical Characteristics

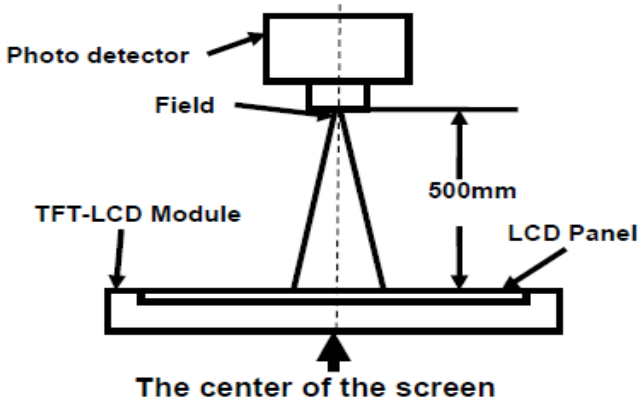
Ta=25℃

Item		Symbol	Condition	MIN.	TYP.	MAX.	UNIT	Note.
Viewing angle (CR≥10)		θ_L	9 o'clock	60	70	-	degree	* 2
		θ_R	3 o'clock	60	70	-		
		θ_T	12 o'clock	50	60	-		
		θ_B	6 o'clock	60	70	-		
Response Time		T_f	25℃	-	25	30	msec	* 1 * 4
		T_r					msec	
Contrast ratio		CR	θ=0°	600	800	-	-	*1,*3
Color chromaticlty	White	X	Backlight is on	0.253	0.303	0.353		* 1 * 5
		Y		0.257	0.307	0.357		
	Red	X		0.525	0.575	0.625		
		Y		0.296	0.346	0.396		
	Green	X		0.298	0.348	0.398		
		Y		0.527	0.577	0.627		
	Blue	X		0.101	0.151	0.201		
		Y		0.031	0.081	0.131		
Luminance		L		200	250	-	cd/m^2	* 1,*6
NTSC				45	50	-	%	* 5
Luminance uniformity		Y_U		70	75	-	%	*1,*7

Note：

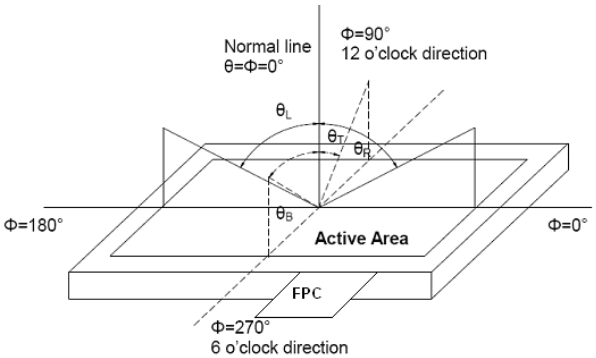
* 1: Definition of optical measurement system.

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	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	
Response Time	TRD100	-

* 2: Definition of viewing angle range

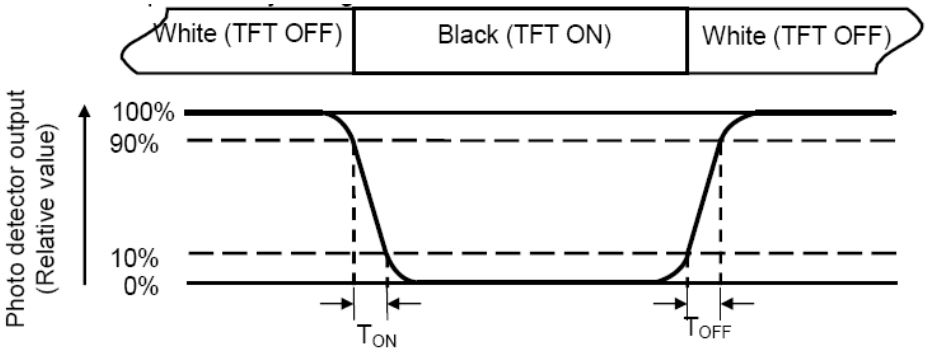


*3: Definition of contrast ratio

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

*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%.



* 5: Definition of color chromaticity (CIE1931)

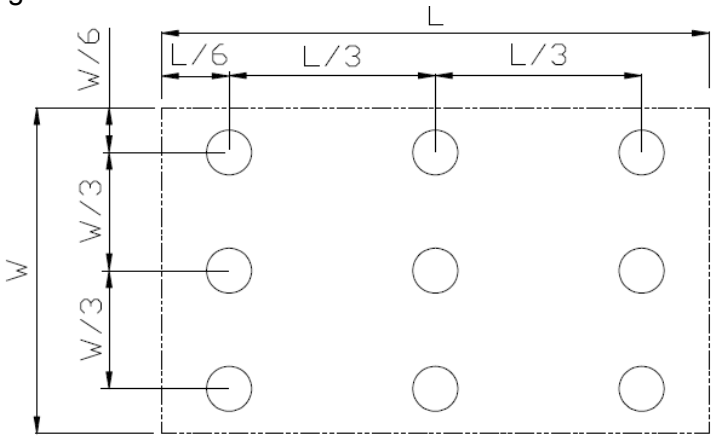
Color coordinates measured at center point of LCD.

* 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.

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. 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.