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

LMT101DNMFWD

LCD Module User Manual

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Date: 2017-10-12	Date:	Date:

Rev.	Descriptions	Release Date
0.1	Preliminary release	2016-12-16
0.2	Enhance Operating Temperature with Product Name update	2017-10-12

Table of Content

1. General Specification

1.1 Display Spec & Electrical Characteristics

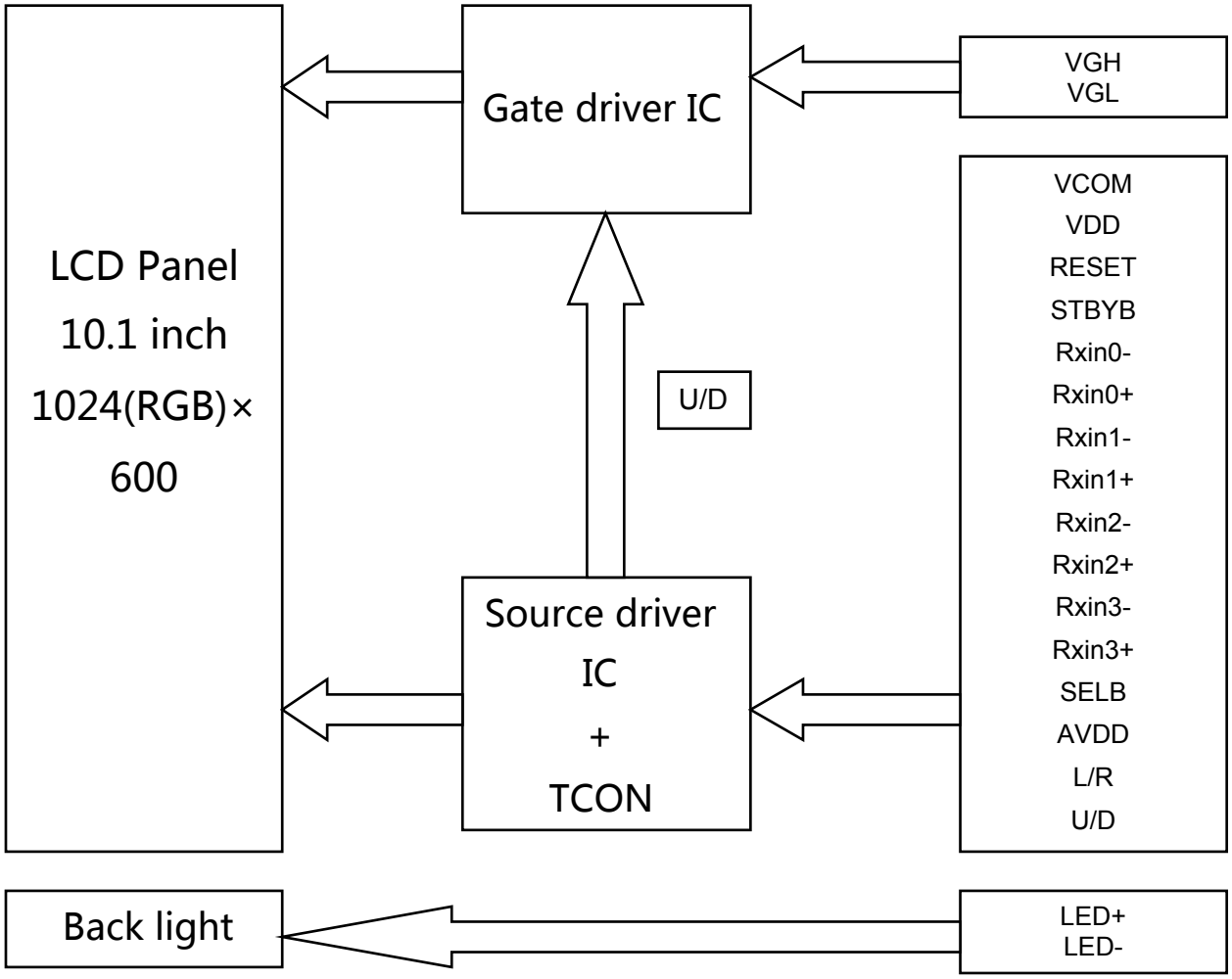
Feature		Spec
Display Spec.	Size	10.1 inch
	Resolution	1024(RGB)×600
	Technology Type	a-si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.2175x0.2088
	Display Mode	Normally White
	Surface Treatment	AG,HC(3H)
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
	With /Without TSP	Without TSP
	LED Numbers	30 LED
	Weight (g)	205(typ), 215(max)
Electrical Characteristics	Interface	6/8 bit LVDS
	Color Depth	16.7M
	Module Power Consumption(W)	2.43(max)

Note 1: Requirements on Environmental Protection: Q/S0002
Note 2: LCM weight tolerance: ± 5%
Note 3: Power Consumption measure at Black image

1.2 Mechanical Characteristics

Item		Min	Typ	Max
LCM (W x H x D) (mm)	With Tape	232.85x136.85x2.8	233.1x137.1x3.05	233.35x137.35x3.3
	Without Tape	232.8x136.8x2.8	233.0x137.0x3.0	233.2x137.2x3.2
Bezel Opening Area（mm）		225.52x128.08	225.72x128.28	225.92x128.48
Active Area(mm)		222.52x125.08	222.72x125.28	222.92x125.48

2. Block Diagram



3. Input/Output Terminals

Pin	Symbol	I/O	Description	Remark
1	VCOM	P	VCOM Power supply	
2	VDD	P	Power supply(3.3V typ)	
3	VDD	P	Power supply(3.3V typ)	
4	NC	P	No connection(Reserved for TM test)	
5	RESET	I	Global Reset.Normally pull high.	
6	STBYB	I	Standby mode control.Normally pull high.	
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	RxCLK-	I	LVDS differential clock input	
18	RxCLK+	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	NC	-	No connection	
24	NC	-	No connection	
25	GND	P	Ground	
26	NC	-	No connection	
27	NC	-	No connection	
28	SELB(HSD)	I	LVDS 6/8 bit selection control SEL=”L”:8bit Use only 8 bit	
29	AVDD	P	Analog power	
30	GND	P	Ground	
31	LED-	P	Back light cathode	
32	LED-	P	Back light cathode	

33	L/R	P	Source Driver internal shift register is controlled by this pin as shown below: Normally pull high.	
34	U/D	I	Gate Driver Up/down Scan setting. Normally pull low.	
35	VGL	I	Negative power of TFT	
36	NC	-	No connection	
37	NC	-	No connection	
38	VGH	P	Positive power of TFT	
39	LED+	P	Back light anode	
40	LED+	P	Back light anode	

4. Absolute Maximum Ratings

GND=0V, Ta =25℃

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	2.8	3.6	V	
Operating Ambient Temperature	TOPR	-20	70	℃	
Storage Ambient Temperature	TSTG	-30	75	℃	
Operating and Storage Humidity	HSTG	10%	90%	%（RH）	

5. Electrical Characteristics

5.1 Driving TFT LCD Panel

VDD=3.3V, GND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Power Supply Voltage		VDD	2.80	3.30	3.60	V	
Power For Analog Circuit		AVDD	10.72	11.02	11.34	V	
Gate On Voltage		VGH	20.46	21.14	23.54	V	
Gate Off Voltage		VGL	-7.35	-7	-6.65	V	
Common Voltage		Vcom	--	4.33	--	V	
Input Signal Voltage	Low Level	VIL	GND	--	0.2xVDD	V	
	High Level	VIH	0.8xVDD	--	VDD	V	
Current of digital Supply voltage		I_{VDD}	--	--	22	mA	VDD=3.3V
Current of analog Supply voltage		I_{AVDD}	--	--	40	mA	AVDD=11.02V
Current of Gate on voltage		I_{VGH}	--	--	0.8	mA	VGH=21.14V
Current of Gate off voltage		I_{VGL}	--	--	0.8	mA	VGL=-7.0V
Current of Vcom		Ivcom	--	--	0.01	mA	

Note: The current of supply voltage measure at black image.

5.2 Driving Backlight

Ta=25℃

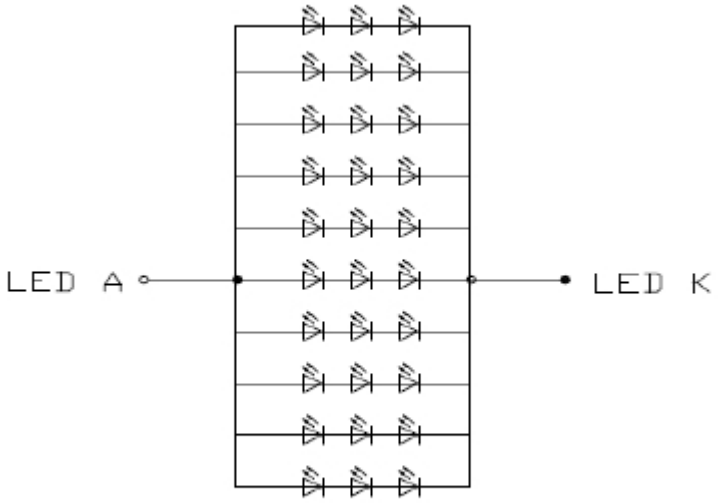
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	200	--	mA	30 LEDs(3 LED Serial,10 LED Parallel)
Forward Current Voltage	V_F	8.4	9.0	9.45	V	
Backlight Power Consumption	W_{BL}	--	1800	--	mW	
LED lifetime	--	15000	--	--	hrs	

Note1: The LED driving condition is defined for each LED module (3 LED Serial,10 LED Parallel).

Note2:Under LCM operating, the stable forward current should be input. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at only Ta=25℃,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.

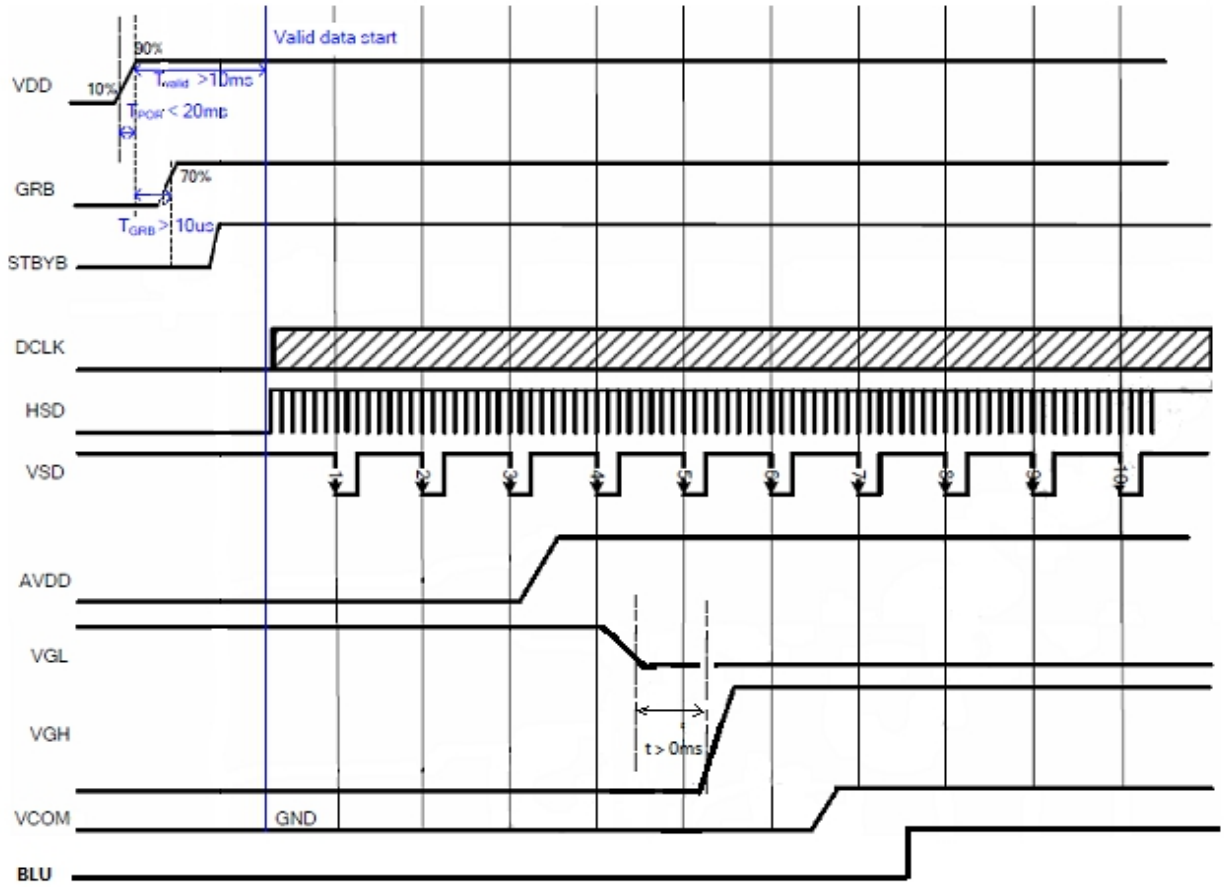
Note4:LED C(C1+C2) chromaticity and BIN code 5-2~6-2.



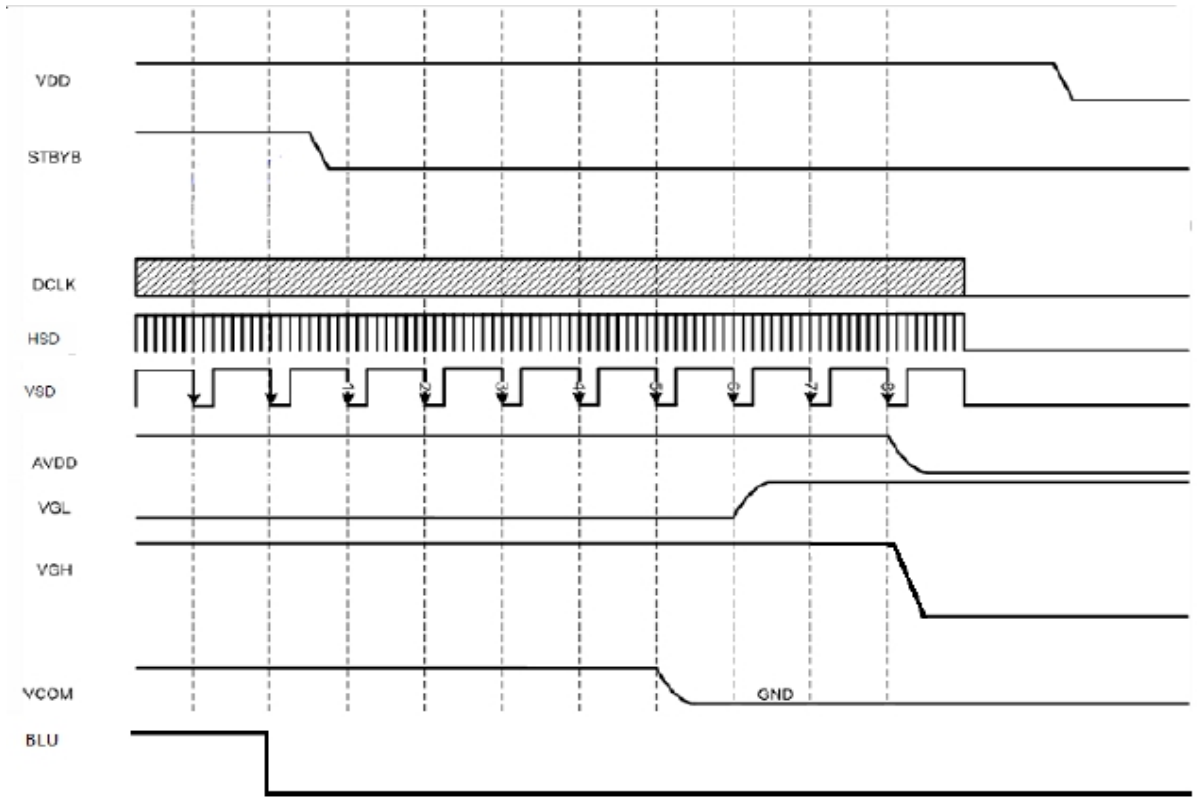
CIRCUIT
DIAGRAM

6. Timing Chart

6.1 Power on/off sequence



Power on sequence



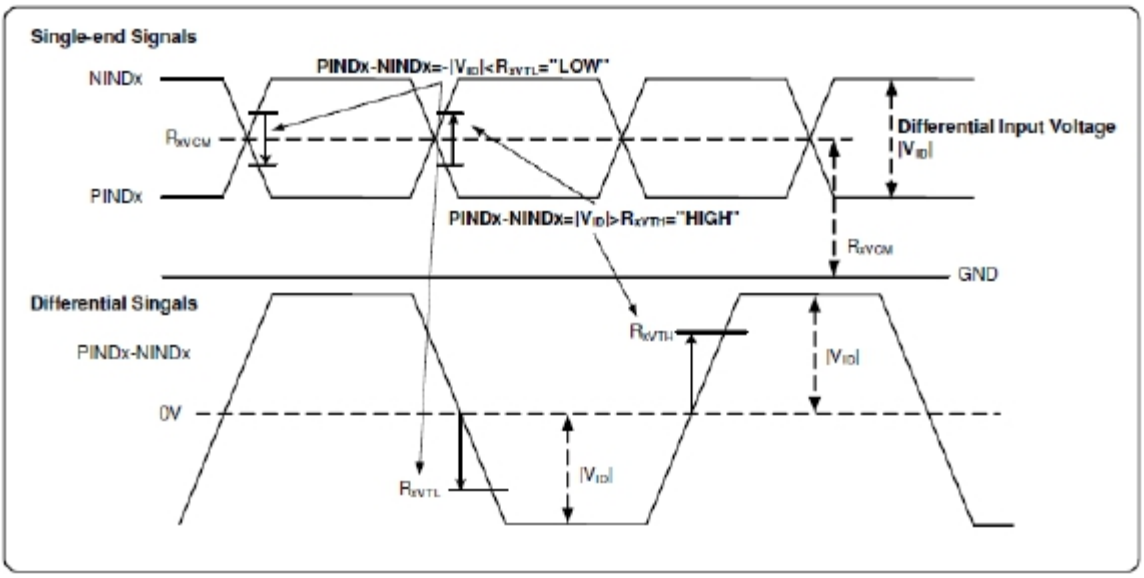
Power off sequence

6.2 LVDS signal timing characteristic

Electrical characteristics

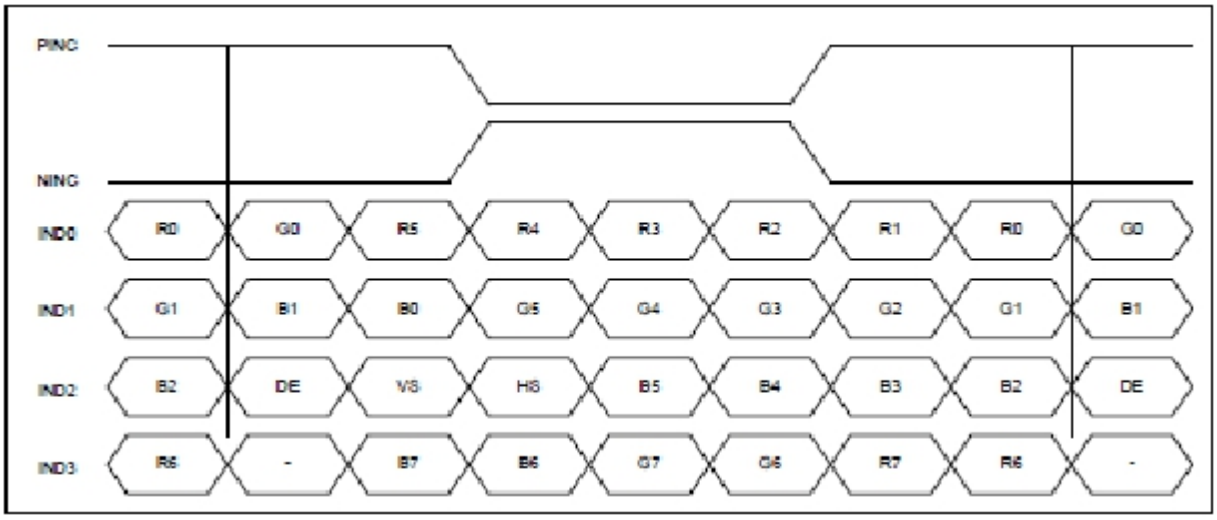
Parameter	Symbol	Condition	Spec. Min.	Spec. Typ.	Spec. Max.	Unit
Differential input high Threshold voltage	R_{XVTH}	R_{XVCM}=1.2V	-	-	+0.1	V
Differential input low threshold voltage	R_{XVTL}	-	-0.1	-	-	V
Input voltage range (Singled-end)	R_{XVIN}	-	0	-	VDD-1.2+ $\|V_{ID}\|/2$	V
Differential input common mode voltage	R_{XVCM}	-	$\|V_{ID}\|/2$	-	VDD-1.2	V
Differential input voltage	$\|V_{ID}\|$	-	0.2	-	0.6	V
Differential input leakage Current	RV_{Kliz}	-	-10	-	+10	μA
LVDS digital operating Current	Iddlvds	Fclk=65MHz, VDD=3.3V	-	15	30	mA
LVDS digital stand-by Current	Istlvds	Clock & all functions are stopped	-	10	50	μA

Single-end signals & Differential singals



6.3 LVDS mode data input format

8-bit LVDS input Timing



DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd		1024		DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+ thfp	90	320	376	DCLK
Vertical display area	tvd		600		T_H
VSD period	tv	610	635	800	T_H
VSD blanking	tvbp+ tvfp	10	35	200	T_H

6.4 Display colors and input data signals

This product can display in equivalent to 16,777,216 colors in 256 gray scales. Also the relation between display colors and input data signals is as the following table.

Display colors		Data signal (0: Low level, 1: High level)																									
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑					:								:								:			
	↓					:								:								:			
	bright	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	↑					:								:								:			
	↓					:								:								:			
	bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue gray scale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	↑					:								:								:			
	↓					:								:								:			
	bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

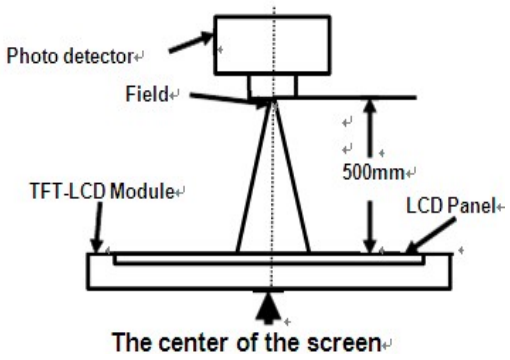
7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	65	75	-	Degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ=0°	600	800	-		Note 3
Response Time		T_{ON}	25℃	-	7	10	ms	Note 4
		T_{OFF}		-	9	18		
Chromaticity	White	x	Backlight is on	0.241	0.281	0.321		Note 1,5
		y		0.260	0.300	0.340		
	Red	x		0.518	0.558	0.598		Note 1,5
		y		0.288	0.328	0.368		
	Green	x		0.276	0.316	0.356		Note 1,5
		y		0.522	0.562	0.602		
	Blue	x		0.115	0.155	0.195		Note 1,5
		y		0.074	0.114	0.154		
Uniformity		U		70	80	-	%	Note 6
NTSC				40	50	-	%	Note 5
Luminance		L		250	300	-	cd/㎡	Note 7

Test Conditions:
1. IF= 20 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.

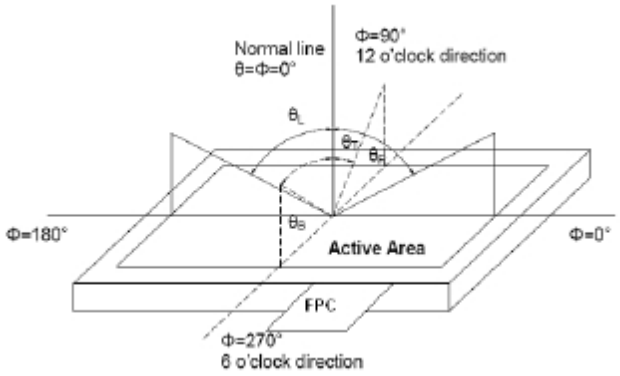
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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

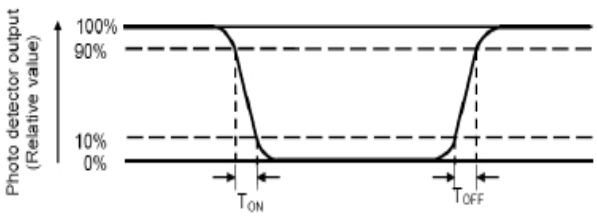
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

“White state “: The state is that the LCD should drive by voltage of white.
“Black state”: The state is that the LCD should drive by voltage of black.

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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

White (TFT off)	Black (TFT on)	White (TFT off)



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

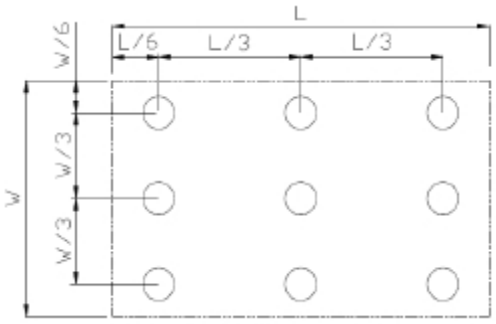
Active area is divided into 9 measuring areas as below. Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

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



Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta= +70℃,240hrs	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta= -20℃,240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +75℃,240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃,240 hrs	IEC60068-2-1:2007 GB2423.1-2008
5	Storage and Operation at high Temperature and Humidity	Ta=+60℃, 90% RH 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20℃ 30 min~+60℃ 30 min, Change time:5min,100 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	MM model ： 0Ω / 200pF ±200 V HBM model： 1.5kΩ / 100pF ±1500 V	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Stroke:1.5G Sweep:10Hz~500 Hz 0.5 hours for each direction of X.Y.Z. (1.5 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	60G 6ms, ± X,± Y,± Z 3times, for each direction	IEC60068-2-27:1987 GB/T2423.5—1995

Note1: Ta is the ambient temperature of sample.

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation.

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

a. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

b. 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.

c. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

d. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

e. 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 alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

－ Water － Ketone － Aromatic solvents

f. Do not attempt to disassemble the LCD Module.

g. If the logic circuit power is off, do not apply the input signals.

h. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

1. Be sure to ground the body when handling the LCD Modules.
2. Tools required for assembly, such as soldering irons, must be properly ground.
3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
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

a. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

b. 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%

c. The LCD modules should be stored in the room without acid, alkali and harmful gas.

9.3 Transportation Precautions

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