



# PHOENIX DISPLAY INTERNATIONAL, INC.

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## PHOENIX DISPLAY INTERNATIONAL, INC SPECIFICATION FOR LCD MODULE

<b>CUSTOMER</b>	
<b>PART NUMBER</b>	PDI057H01
<b>DESCRIPTION</b>	5.7" TFT 320 x 240
<b>VERSION</b>	0.2
<b>ISSUE DATE</b>	01-05-2011

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<b>Display Spec.</b>	Size	5.7 inch
	Resolution	320(RGB) x 240
	Interface	RGB 18-bit
	Color Depth	6-bit
	Display colors	262K
	Technology Type	a-Si TFT
	Pixel Pitch (mm)	0.360 x 0.360
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Anti-Glare, Hardness 3H
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
<b>Mechanical Characteristics</b>	LCM (W x H x D) (mm)	144.00x104.60x12.30
	Active Area(mm)	115.20 x 86.40
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	21 LEDs

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: LCM weight tolerance: +/- 5%

## 2 Input/Output Terminals

### 2.1 CN1 pin assignment (Signal interface)

Connector type: 089H33-000100-G2-R (STARCONN)

1	GND	P	Ground	
2	DOTCLK	I	Dot clock. Latch data at falling edge of DOTCLK.	
3	Hsync	I	Horizontal sync signal in SYNC mode.	
4	Vsync	I	Vertical sync signal in SYNC mode.	
5	GND	P	Ground	
6	R0	I	Red data (LSB)	
7	R1	I	Red data	
8	R2	I	Red data	
9	R3	I	Red data	
10	R4	I	Red data	
11	R5	I	Red data (MSB)	
12	GND	P	Ground	
13	G0	I	Green data(LSB)	
14	G1	I	Green data	
15	G2	I	Green data	
16	G3	I	Green data	
17	G4	I	Green data	
18	G5	I	Green data(MSB)	
19	GND	P	Ground	
20	B0	I	Blue data(LSB)	
21	B1	I	Blue data	
22	B2	I	Blue data	
23	B3	I	Blue data	
24	B4	I	Blue data	
25	B5	I	Blue data(MSB)	
26	GND	P	Ground	
27	ENABLE	I	Data enable signal in DE mode. This pin must be floating when SYNC mode.	
28	VCC	P	Power supply	
29	VCC	P	Power supply	

30	R/L	I	Set horizontal scan direction: Low/NC: left to right; High: right to left	
31	U/D	I	Set vertical scan direction: High/NC: up to down; Low: down to up	
32	NC	-	No connection	
33	GND	P	Ground	

P: Power/GND; I: input pin;

Note1: CN1 Matching FPC type: 33 pin, pitch: 0.5mm, height: 0.3mm.

## 2.1 Backlight interface

Connector type: SHLP-06V-S-B (JST)

1	AN1	P	LED driving anode 1 (high voltage)	Red
2	AN2	P	LED driving anode 2 (high voltage)	Red
3	AN3	P	LED driving anode 3 (high voltage)	Red
4	CA1	P	LED driving cathode 1 (low voltage)	White
5	CA2	P	LED driving cathode 2 (low voltage)	Blue
6	CA3	P	LED driving cathode 3 (low voltage)	Black

Note1: CN2 Matching Connector type: SM06B-SHLS-TF (JST)

### 3 Absolute Maximum Ratings

GND=0V, Ta = 25°C

Power Voltage	VCC	-0.5	5.0	V	
Input voltage	V <sub>IN</sub>	-0.5	5.0	V	Note1
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	85	°C	

Note1: Signals include R0~R5, G0~G5, B0~B5, Dotclk, Hsync, Vsync, Enable, R/L, U/D.

## 4 Electrical Characteristics

### 4.1 LCD module

GND=0V, Ta=25°C

Supply Voltage	VCC	3.00	3.30	3.60	V	
Permissible input ripple voltage	$V_{RF}$	-	-	100	mVp-p	VCC=3.3V
Input Signal Voltage	Low Level	$V_{IL}$	0	-	0.3*VCC	V
	High Level	$V_{IH}$	0.7*VCC	-	VCC	V
Common Electrode Driving Signal	VCOM	-	TBD.	-	V	Note1
Current of VCC Power supply	$I_{VCC}$	-	TBD.	TBD.	mA	Note2

Note1: For different LCM, the value may have a bit of difference.

Note2: To test the current dissipation, use "all Black Pattern".



## 4.2 Recommended Driving Condition for Backlight

Ta=25°C

Channel 1 Forward Current	$I_{\text{channel 1}}$	-	25.0	-	mA	
Channel 2 Forward Current	$I_{\text{channel 2}}$	-	25.0	-	mA	
Channel 3 Forward Current	$I_{\text{channel 3}}$	-	25.0	-	mA	
Forward Voltage	$V_{\text{BL}}$	19.95	-	25.90	V	Note 2
Backlight Power Consumption	$W_{\text{BL}}$	-	1750	-	mW	Note 1

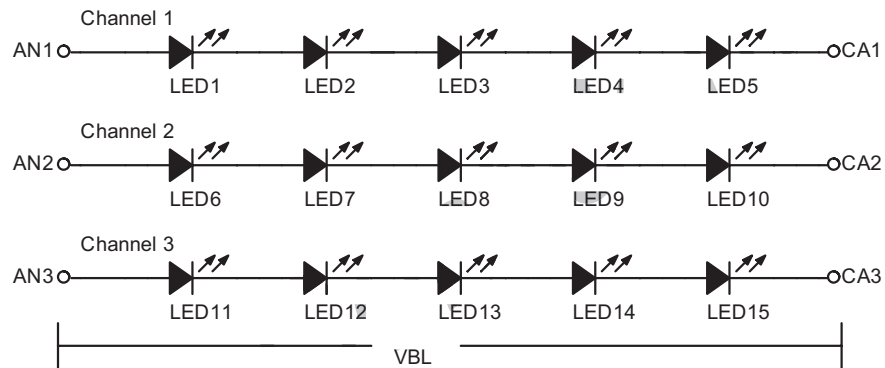
Note 1: The LED driving condition is defined for total backlight consumption.

Note 2: Forward Voltage adjusting must depend on Forward Current setting.

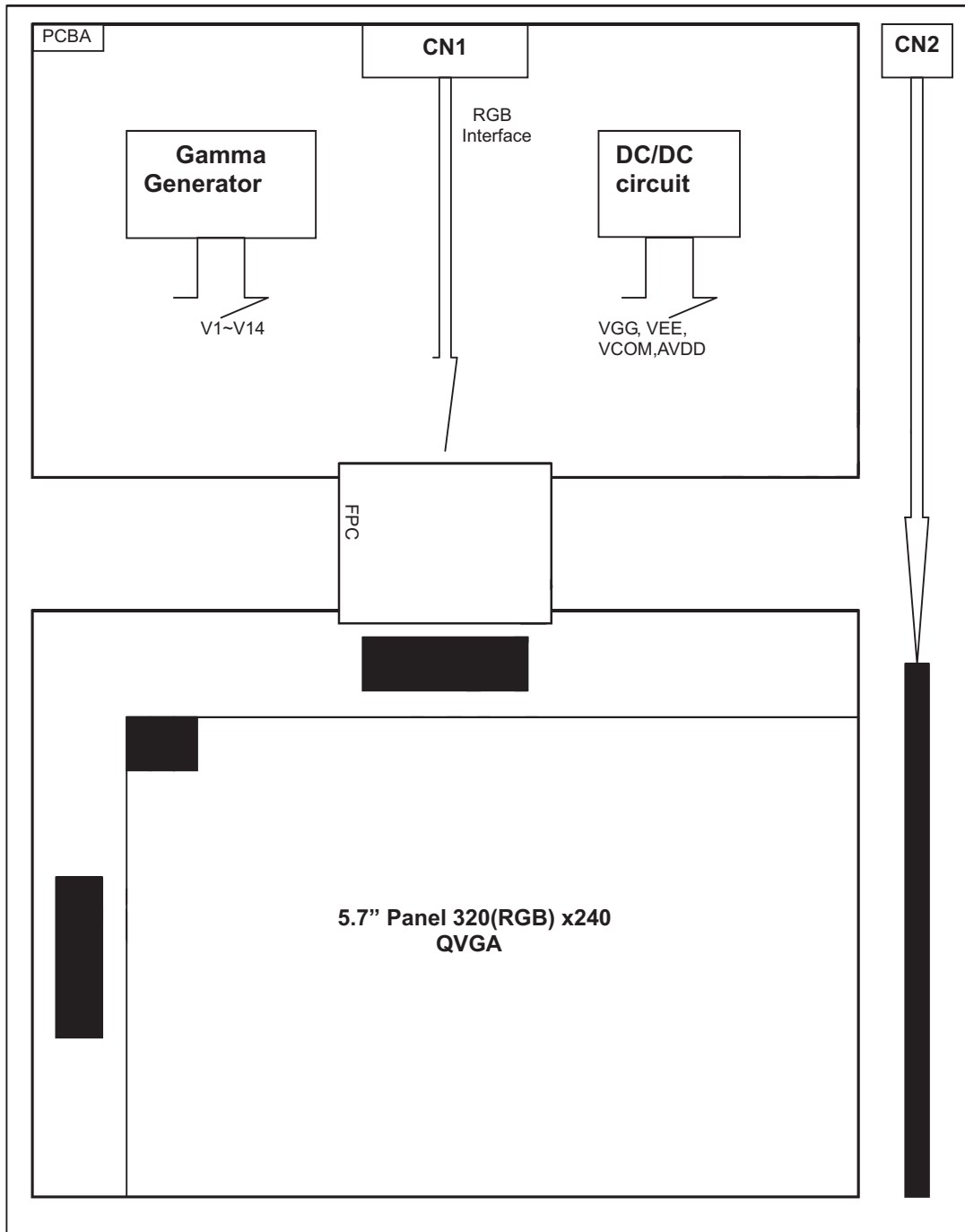
Note 3: One LED:  $I_F = 25 \text{ mA}$ ,  $V_F = 3.3 \text{ V}$ .

Note 4: The LED Lifetime Typ. 50, 000 hours.

### LED Connection of Backlight



### 4.3 Block Diagram



## 5 Timing Chart

### 5.1 AC Electrical Characteristics

#### 5.1.1 SYNC mode:

Dotclk	Dotclk frequency	Fclk	6.2	6.4	12.1	MHz
	Dotclk cycle	Tclk	82.64	156.25	161.29	ns
Hsync	Horizontal display area	Thd	320	320	320	Tclk
	1 horizontal line	Th	406	408	560	Tclk
	Hsync pulse width	Thpw	1	-	-	Tclk
	Horizontal blanking	Thb	70	70	70	Tclk
	Horizontal front porch	Thfp	16	18	170	Tclk
Vsync	Frame rate	-	-	60	-	Hz
	Vertical display area	Tvd	240	240	240	Th
	Vsync period time	Tv	254	263	360	Th
	Vsync pulse width	Tvpw	1	-	-	Th
	Vsync blanking	Tvb	13	13	13	Th
	Vsync front porch	Tvfp	1	10	107	Th

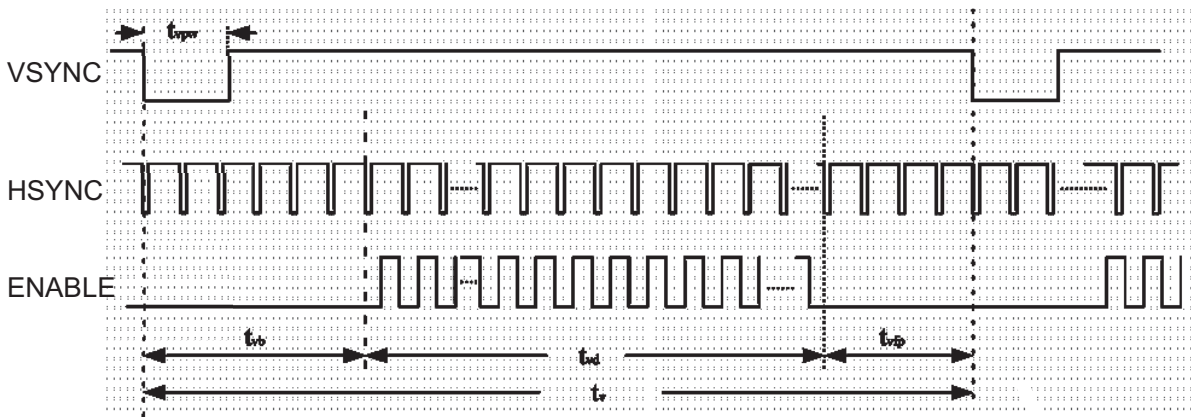
#### 5.1.2 DE mode:

Dotclk frequency		Fclk	6.2	6.4	12.1	MHz
Horizontal section	Horizontal total	Th	406	408	560	Tclk
	H Total blank	Thb+Thfp	86	88	240	Tclk
	Valid Data Width	Thd	320	320	320	Tclk
Vertical section	Frame rate	-	-	60	-	Hz
	Vertical total	Tv	254	263	360	Th
	V total blank	Tvb+Tvfp	14	23	120	Th
	Valid Data Width	Tvd	240	240	240	Th

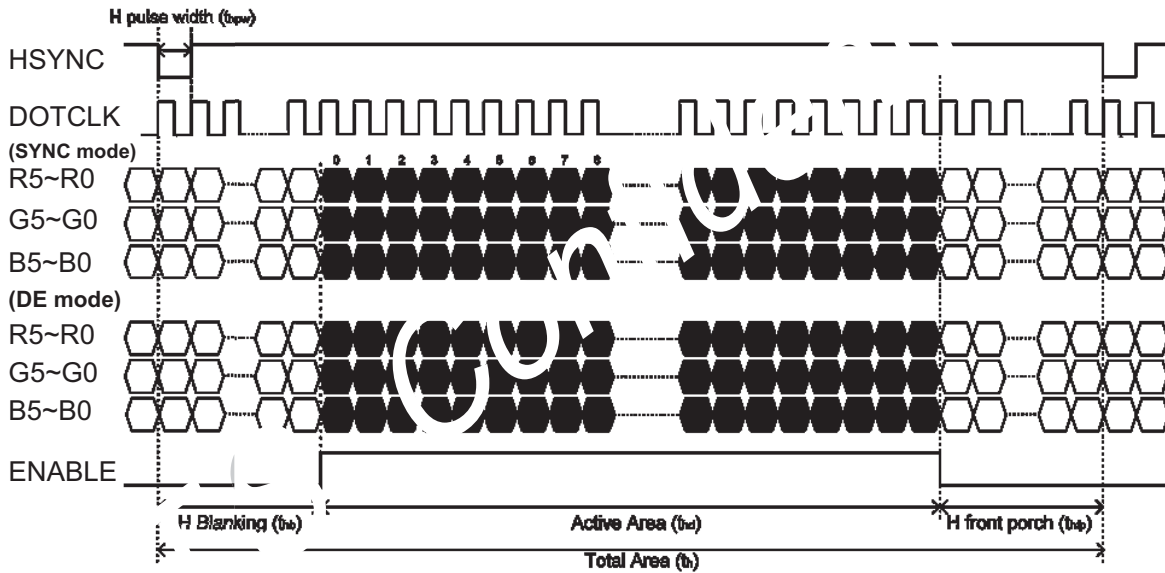
Note: The LCM could auto-detect which mode is working.

## 5.2 Timing Diagram

### 5.2.1 Vertical Input Timing



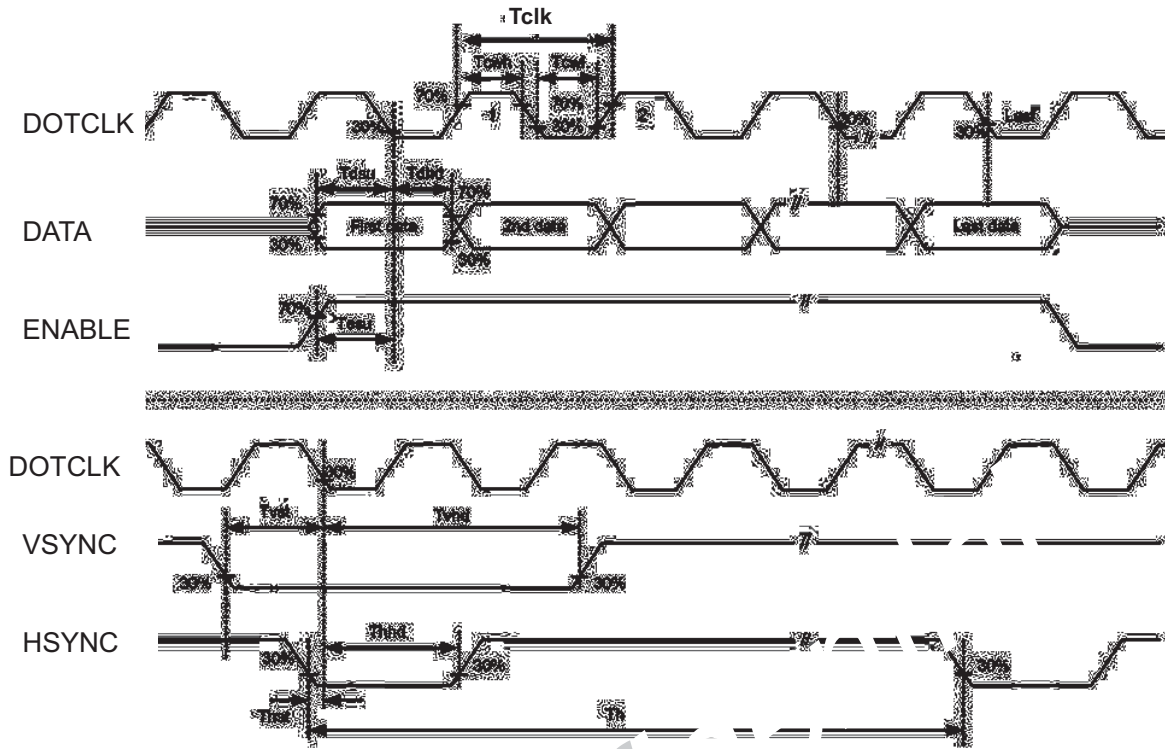
### 5.2.2 Horizontal Input Timing



## 5.3 AC input characteristics

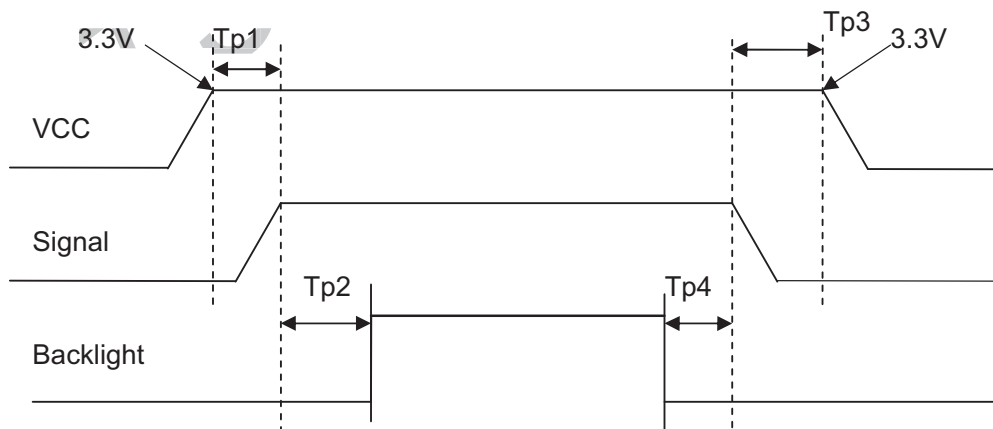
(VCC=3.3V, GND=0V, Ta=25°C)

Parameter	Symbol	40%	50%	60%	Unit	Notes
DOTCLK pulse duty	Tcwh	40%	50%	60%	Tclk	
VSYNC setup time	Tvst	8	-	-	ns	
VSYNC hold time	Tvhd	8	-	-	ns	
HSYNC setup time	Thst	8	-	-	ns	
HSYNC hold time	Thhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	Rn, Gn, Bn to Dotclk
Data hold time	Tdhd	8	-	-	ns	Rn, Gn, Bn to Dotclk
Enable setup time	Tesu	8	-	-	ns	



5.4 Power On\Off Sequence

VCC 3.0V to signal starting	Tp1	5	-	50	ms	
Signal starting to backlight on	Tp2	TBD.	-	-	ms	
Signal off to VCC 3.0V	Tp3	0	-	50	ms	
Backlight off to signal off	Tp4	TBD.	-	-	ms	



## 6 Optical Characteristics

Ta=25°C

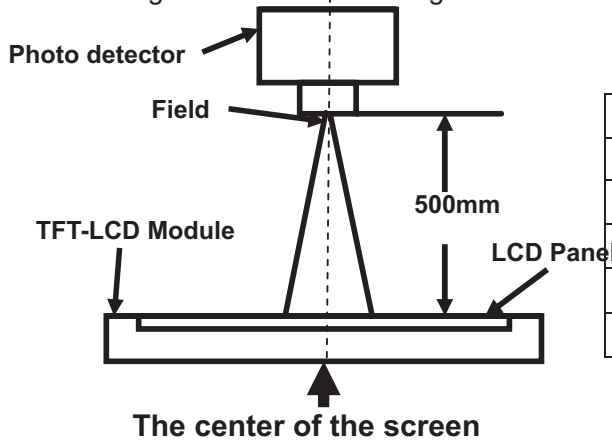
View Angles	$\theta T$	CR $\geq$ 10	50	70	-	Degree	Note2,3
	$\theta B$		40	50	-		
	$\theta L$		50	70	-		
	$\theta R$		50	70	-		
Contrast Ratio	CR	$\theta=0^\circ$	400	500	-		Note 3
Response Time	T <sub>ON</sub>	25°C	-	25	40	ms	Note 4
	T <sub>OFF</sub>						
Chromaticity	White	Backlight is on	x	TBD	TBD	TBD	Note 1,5
			y	TBD	TBD	TBD	
	Red		x	TBD	TBD	TBD	Note 1,5
			y	TBD	TBD	TBD	
	Green		x	TBD	TBD	TBD	Note 1,5
			y	TBD	TBD	TBD	
	Blue		x	TBD	TBD	TBD	Note 1,5
			y	TBD	TBD	TBD	
Uniformity	U		75	80	-	%	Note 6
NTSC			-	50	-	%	Note 5
Luminance	L		300	500	-	cd/m <sup>2</sup>	Note 7

Test Conditions:

1. The ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

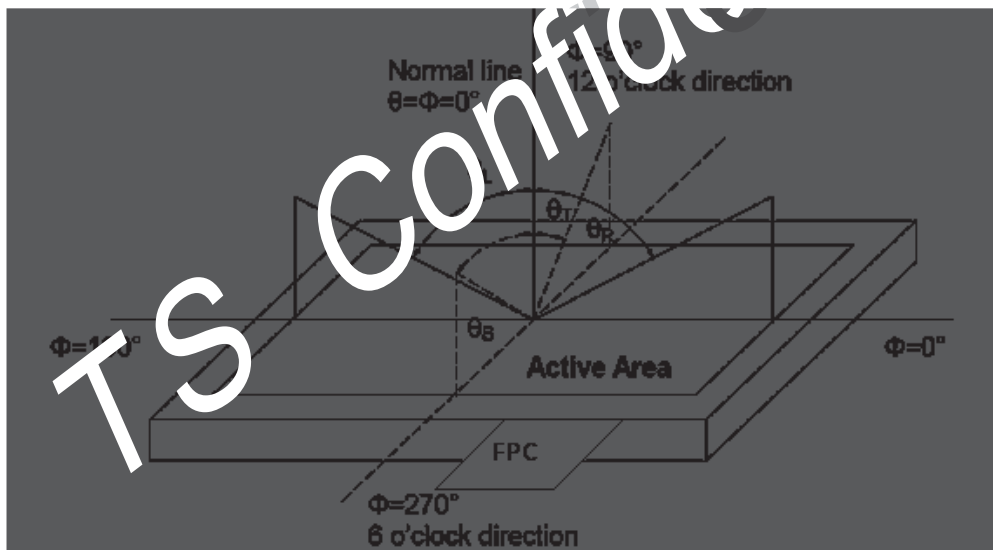
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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

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

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

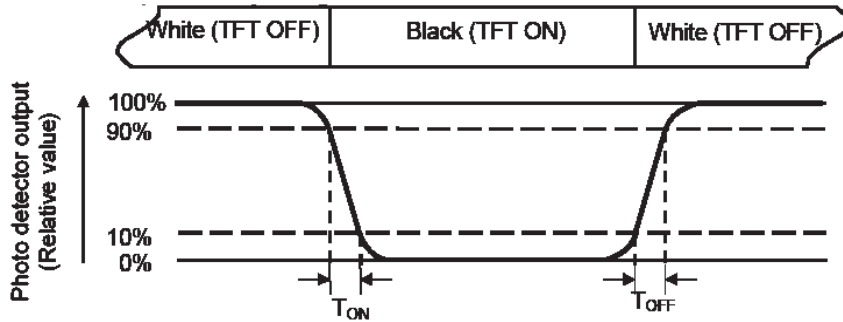
“White state “: The state is that the LCD should drive by V<sub>white</sub>.

“Black state”: The state is that the LCD should drive by V<sub>black</sub>.

V<sub>white</sub>: To be determined    V<sub>black</sub>: 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)

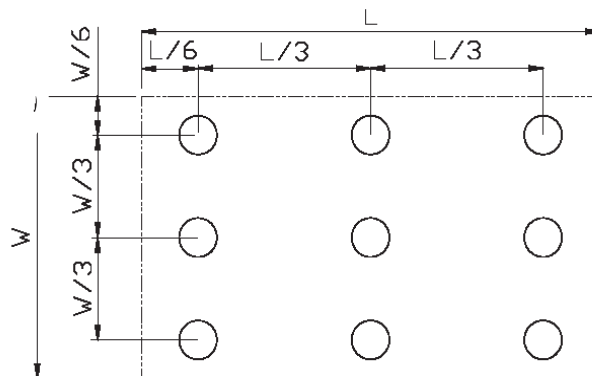
Color coordinates measured at center point of LCD.

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.

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

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



$L_{\max}$ : The measured Maximum luminance of all measurement position.

$L_{\min}$ : The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

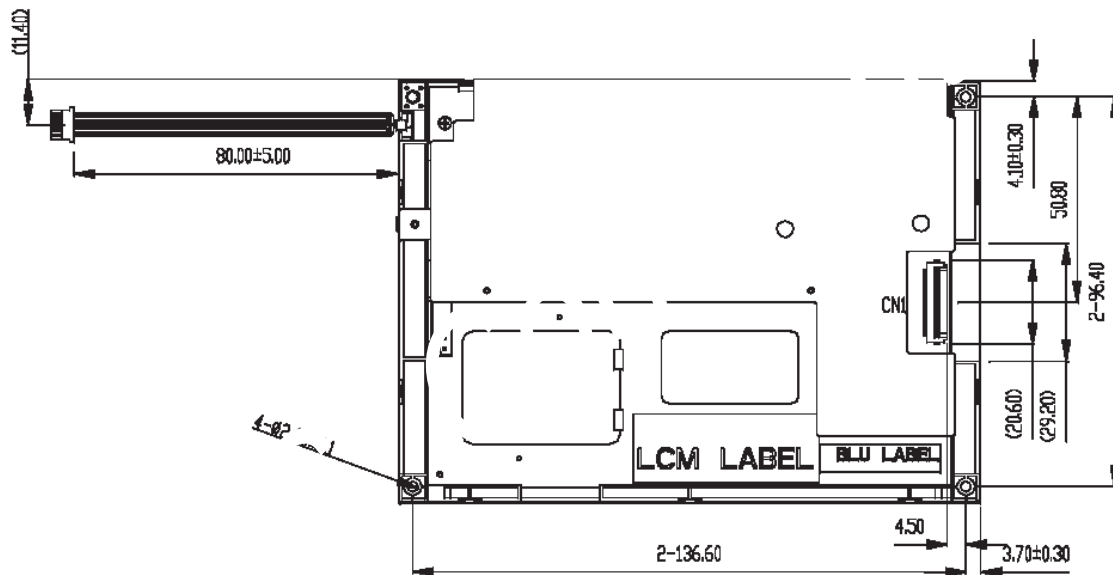
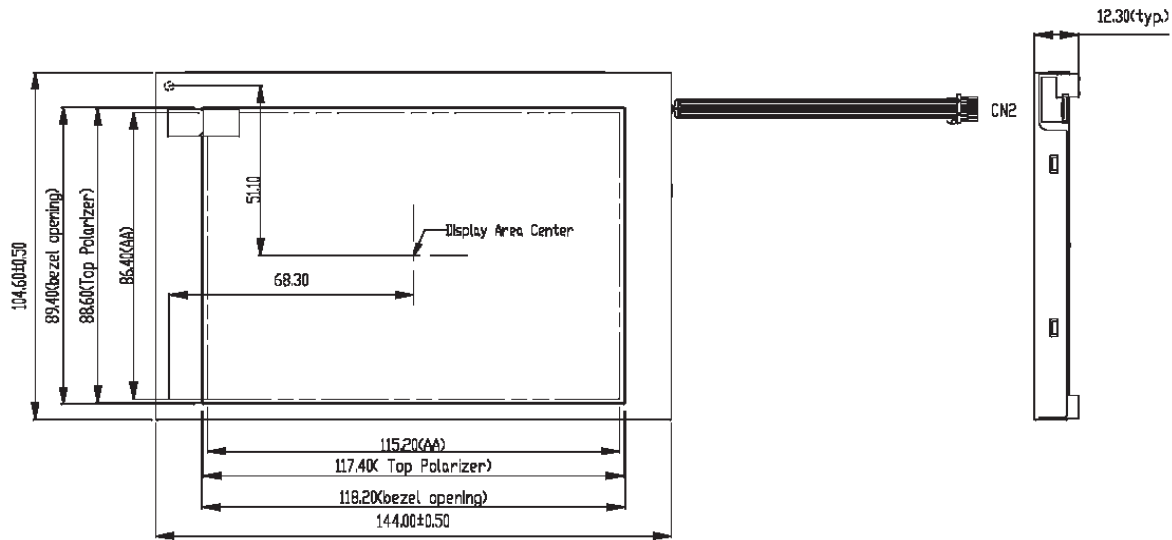


## 7 Environmental / Reliability Test

1	High Temperature Operation	Ts=+85°C, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	Low Temperature Operation	Ta=-30°C, 240hrs	IEC60068-2-1 GB2423.1—89
3	High Temperature Storage (non-operation)	Ta=+85°C, 240hrs	IEC60068-2-2, GB2423.2—89
4	Low Temperature Storage (non-operation)	Ta=-30°C, 240hrs	IEC60068-2-1 GB2423.1—89
5	High Temperature & High Humidity Operation	Ta = +60°C,90% RH max,240 hours	Note2 IEC60068-2-3, GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20°C 30 min~+60°C 30 min, Change time:5min, 100 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14,GB2423.22—87
7	Electro Static Discharge (operation)	Contact : ± 8KV/ operation, Class B; Air : ± 15KV / operation, Class B (RL=150, CL=330pF)	IEC61000-4-2 GB/T17626.2—1998
8	Vibration (non-operation)	Sine wave, 1.5G, 10~200~10Hz, 30mins/axis, 3 direction (X, Y, Z)	IEC60068-2-6 GB/T2423.10—1995
9	Shock (non-operation)	50G,20ms,Half-sine wave, (±X, ±Y, ±Z) 3times for each direction	IEC60068-2-27 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/2423.8—1995
11	Package Vibration Test	Random Vibration: 0.015G*G/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total)	IEC60068-2-34

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.



Notes:

- 1.unmarked tolerance:±0.50mm;
- 2.Display Type: a-Si TFT ;
- 3.Operating Temperature:-30°C~+85°C;
- 4.Storage Temperature:-30°C~+85°C;
- 5.Gray Scale Inversion: 12 o'clock;
- 6.CN2 LED Power source Connector:SHLP-06V-S-B(JST) or Compatible,  
Mating Connector:SM06B-SHLS-TF(JST) or Compatible;
- 7.CN1 Connector type: 089H33-000100-G2-R (STARCONN)
- 8.Requirement on Environment Protection: Q/S0002.

**9 Packing Drawing (TBD)**

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3.						
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## 10 Precautions for Use of LCD Modules

- a) Handling Precautions
  - i. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
  - ii. 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.
  - iii. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
  - iv. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
  - v. 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
  - vi. Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
    - Water
    - Ketone
    - Aromatic solvents
  - vii. Do not attempt to disassemble the LCD Module.
  - viii. If the logic circuit power is off, do not apply the input signals.
  - ix. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- b) Be sure to ground the body when handling the LCD Modules.
- c) Tools required for assembly, such as soldering irons, must be properly ground.
- d) To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
- e) 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.
- f) Storage precautions
  - i. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
  - ii. 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:
    - g) Temperature : 0°C ~ 40°C      Relatively humidity: ≤80%
  - i. The LCD modules should be stored in the room without acid, alkali and harmful gas.
- ii. Transportation Precautions
  - h) The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.