



TFT LCD Approval Specification

Model No.:P070WQ0-C03

Customer : _____

Approval by: _____

Note:



Record of Revisions

Ver.	Date	Page	Description of change
1.0	Dec.15.2006	All	Product specification was first issued



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1.0 GENERAL DESCRIPTION

1.1 Introduction

P070WQ0-A02 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 7.0 (16:9) inch diagonally measured active display area with 1440 x 234 dot (480 horizontal by 234 vertical pixels) resolution.

1.2 Features

- 7 (16:9 diagonal) inch configuration
- Compatible with NTSC & PAL system
- Image Reversion: UP/DOWN and LEFT/RIGHT
- RoHS and UL Compliance

1.3 Applications

- Portable TV
- Portable DVD
- Multimedia applications and Others AV system

1.4 General information

Item	Specification	Unit	
Outline Dimension	164.9 x 100 x 5.5 (Typ.)	mm	
Display area	154.08(H) x 86.58(V)	mm	
Number of Pixel	480 RGB(H) x234(V)	pixels	
Pixel pitch	0.321(H) x 0.370(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display mode	Normally white		
Surface treatment	Antiglare, Hard-Coating(3H) with WV film		
Weight	165	g	
Back-light	LED (Side-Light type)		
Power Consumption	Logic System	36.4	mW
	LED B/L System	2.2	W(Max.)

1.5 Mechanical Information

Item	Min.	Typ.	Max.	Unit	
Module Size	Horizontal(H)	164.4	164.9	165.4	mm
	Vertical(V)	99.5	100.0	100.5	mm
	Depth(D)	—	5.5	—	mm
Weight	—	165	—	g	

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	DV_{DD}	-0.3	6.0	V	GND=0
	V_{GH}	-0.3	40	V	GND=0
	V_{GL}	-20	0.3	V	GND=0
	$V_{GH} - V_{GL}$	-0.3	40	V	
	AV_{DD}	-0.3	7.0	V	AGND=0
	V_{COM}	-1.6	5.2	V	
Analog Signal Input Level	V_R, V_G, V_B	-0.2	$AV_{DD}+0.2$	V	
Logic Signal Input Level	V_I	-0.3	$DV_{DD} +0.3$	V	

2.1.2 Back-Light Unit

Item	Symbol	Typ	Max.	Unit	Note
LED current	I_F	0	140	mA	(1) (2)(3)
LED voltage	V_L	10	10.5	V	(1) (2) (3)

- Note (1) Permanent damage may occur to the LCD module if beyond this specification.
 Functional operation should be restricted to the conditions described under normal operating conditions.
- (2) $T_a = 25 \pm 2^\circ\text{C}$
- (3) Test condition :LED current 140 mA

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-10	60	$^\circ\text{C}$	
Storage Temperature	T_{stg}	-20	70	$^\circ\text{C}$	

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast	CR	$\Theta=0$ Normal viewing angle	—	300	—		(1)(2)	
Response time	Rising		T_R	—	15	—	ms	(1)(3)
	Falling		T_F	—	35	—		
White luminance (Center)	Y_L			—	200	—	cd/m ²	(1)(4) ($I_F=140mA$)
Color chromaticity (CIE1931)	White	W_x	$\Theta=0$		0.31		(1)(4)	
		W_y			0.33			
Viewing angle	Hor.	Θ_L	CR>10	—	60	—		
		Θ_R		—	60	—		
	Ver.	Θ_U		—	40	—		
		Θ_D		—	60	—		
Brightness uniformity	B_{UNI}	$\Theta=0$	70	—	—	%	(5)	

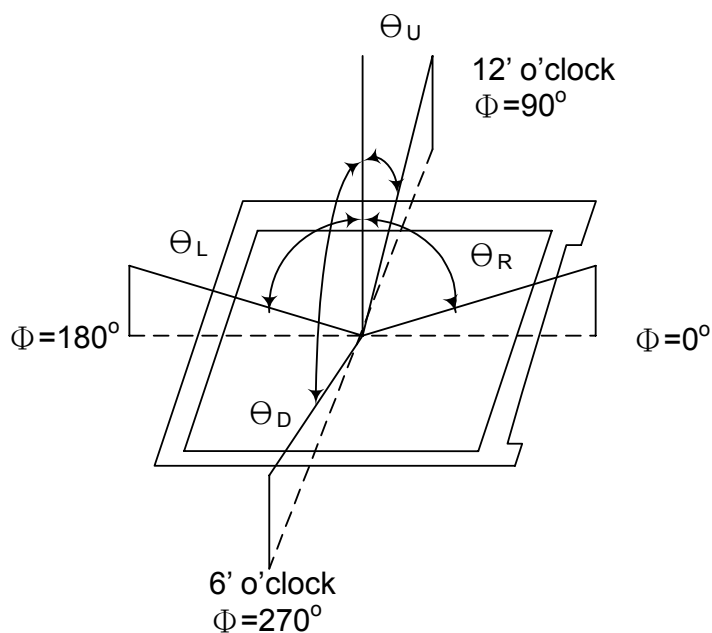
3.2 Measuring Condition

- Measuring surrounding : dark room
- LED current I_F :140mA
- Ambient temperature : $25\pm 2^\circ C$
- 30min. warm-up time.

3.3 Measuring Equipment

- TOPCON BM-7 for Chromaticity and other optical characteristics.
- Measuring spot size : 10 ~ 12 mm

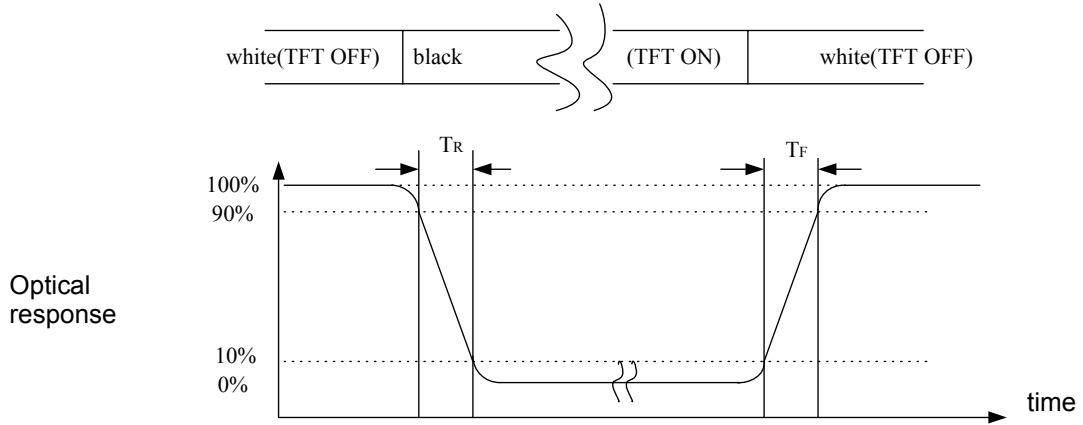
Note (1) Definition of Viewing Angle :



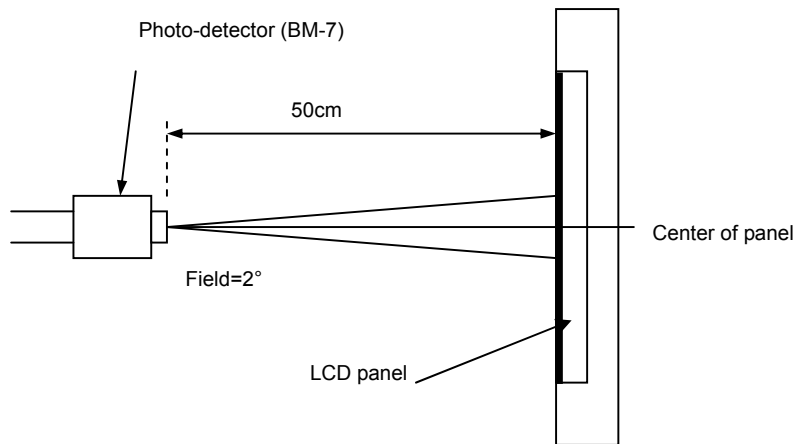
Note (2) Definition of Contrast Ratio(CR) :
 measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

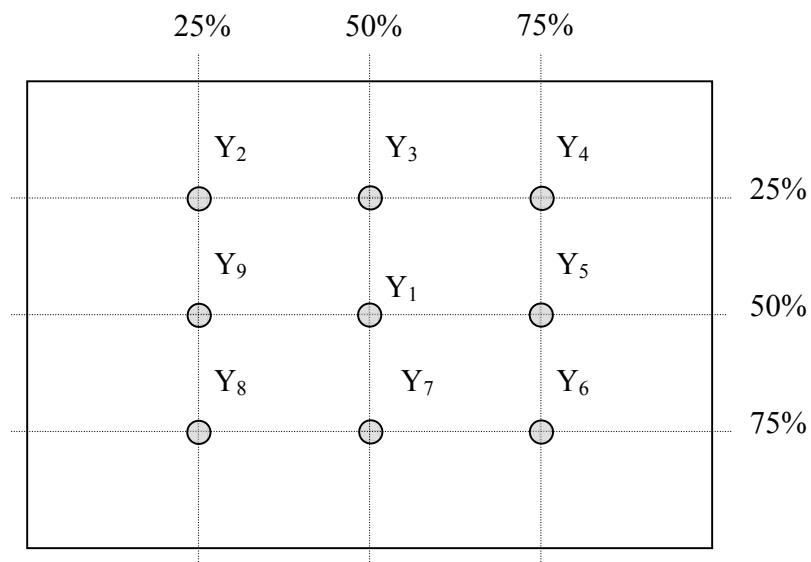
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



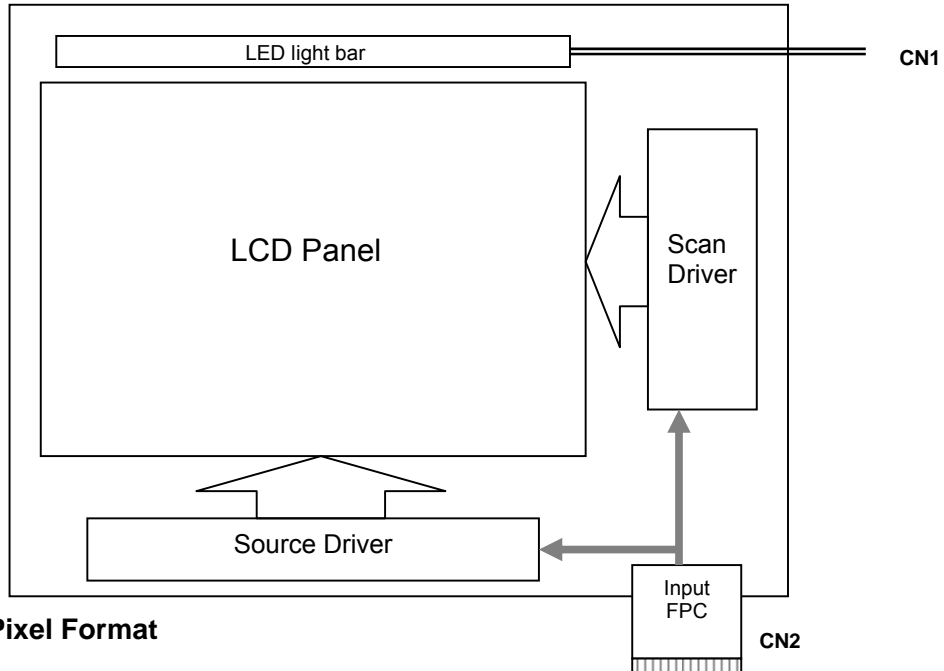
Note (5) Definition of brightness uniformity



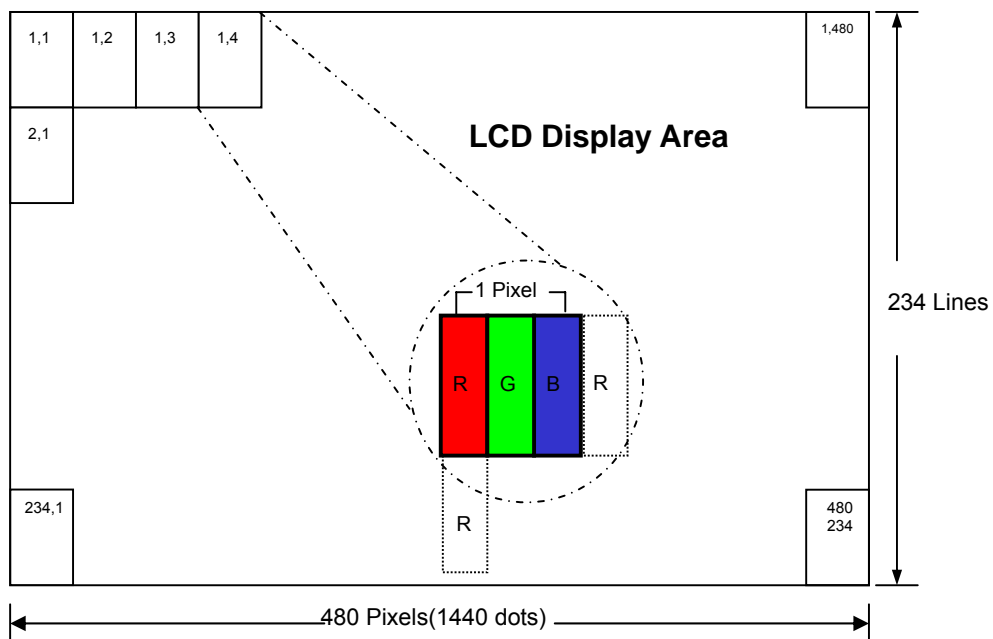
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format



5.0 INTERFACE PIN CONNECTION

5.1 TFT LCD Module

CN2 (Input signal): FPC Down Connector, 26 pins, pitch: 0.5mm

Terminal no.	Symbol	I/O	Function	Note
1	DGND	-	Ground for logic circuit	
2	DV _{DD}	I	Supply voltage of logic control circuit for scan (Gate) driver	
3	V _{GL}	I	Negative power for scan (Gate) driver	
4	V _{GH}	I	Positive power for scan (Gate) driver	
5	STVD	I/O	Vertical start pulse	(1)
6	STVU	I/O	Vertical start pulse	(1)
7	CKV	I	Shift clock input for scan (Gate) driver	
8	U/D	I	UP/DOWN scan control input	(1)
9	OEV	I	Output enable input for scan(Gate) driver	
10	V _{COM}	I	Common electrode driving signal	
11	V _{COM}	I	Common electrode driving signal	
12	L/R	I	LEFT/RIGHT scan control input	(1)
13	MOD	I	Sequential sampling and simultaneous sampling setting	(2)
14	OEH	I	Output enable input for data (Source) driver	
15	STHL	I/O	Start pulse for horizontal scan (Gate) line	(1)
16	STHR	I/O	Start pulse for horizontal scan (Gate) line	(1)
17	CPH3	I	Sampling and shifting clock pulse for data (Source) driver	(2)
18	CPH2	I	Sampling and shifting clock pulse for data (Source) driver	(2)
19	CPH1	I	Sampling and shifting clock pulse for data (Source) driver	
20	DV _{DD}	I	Supply voltage of logic control circuit for data(Source) driver	
21	DGND	-	Ground for logic circuit	
22	V _R	I	Alternated video signal input(Red)	
23	V _G	I	Alternated video signal input(Green)	
24	V _B	I	Alternated video signal input(blue)	
25	AV _{DD}	I	Supply voltage for analog circuit	
26	AGND	-	Ground for analog circuit	

Note (1) Selection of scanning mode (please refer to the following table)

Setting of scan control input		IN/OUT state for start pulse				Scanning direction
U/D	L/R	STVD	STVU	STHR	STHL	
GND	DV _{DD}	Output	Input	Output	Input	up to down, and from left to right.
DV _{DD}	GND	Input	Output	Input	Output	down to up, and from right to left.
GND	GND	Output	Input	Input	Output	up to down, and from right to left.
DV _{DD}	DV _{DD}	Input	Output	Output	Input	down to up, and from left to right.

Note (2) MOD=H: Simultaneous sampling.(Please check CPH2 and CPH3 to GND when MOD=H)
 MOD=L: Sequential sampling.

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	DV_{DD}	3	3.3	5.5	V	
	V_{GH}	14.3	15	15.7	V	
	V_{GL}	-10.5	-10	-9.5	V	
	AV_{DD}	4.5	5	5.5	V	
Video signal amplitude (VR, VG, VB)	V_{iA}	0.4	-	$AV_{DD}-0.4$	V	
	V_{iAC}	-	3	-	V	AC component,
	V_{iDC}	-	$AV_{DD}/2$	-	V	DC component
VCOM	V_{CAC}	-	5.6	-	VP-P	AC component
	V_{CDC}	1.6	1.8	2.0	V	DC component, (1)
Input signal voltage	V_{iH}	$0.8DV_{DD}$	-	DV_{DD}	V	(2)
	V_{iL}	0	-	$0.2 DV_{DD}$	V	(2)
Current of power supply	I_{DD}	-	127	-	uA	$DV_{DD}=3.3V$
	I_{ADD}	-	7.0	-	mA	$AV_{DD}=5V(\text{Black})$
	I_{GH}	-	70	-	uA	$V_{GH}=15V$
	I_{GL}	-	65	-	uA	$V_{GL}=-10V$

Note (1): The brightness of LCD panel could be changed by adjusting the AC component of VCOM.

Note (2): STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D

Note (3): Be sure to apply the power voltage as the power sequence spec.

Note (4) : DGND=AGND=0V,

6.2 Back-Light Unit

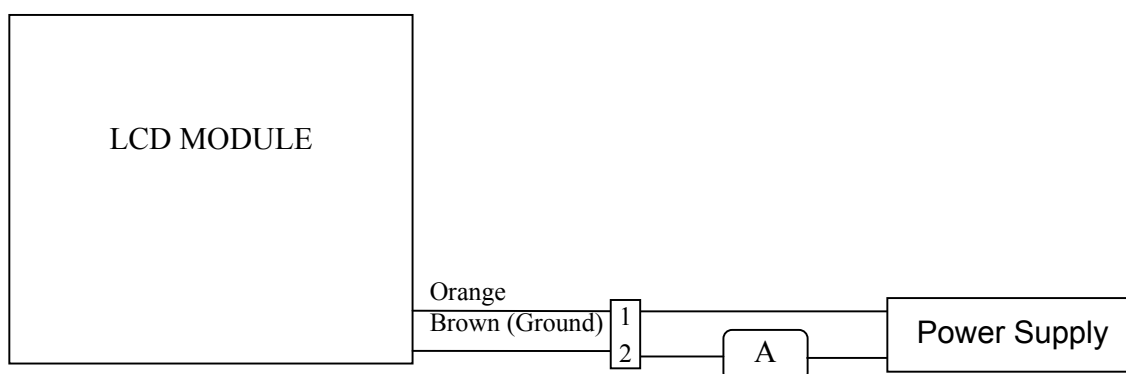
The back-light system is an edge-lighting type with 1 LED Light Bar.

The characteristics of the LED Light Bar is shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	I_F	—	—	140	mA	(1)
LED voltage	V_L	—	10	10.5	V	
Operating LED life time	Hr	20,000	—	—	Hour	(2)

This back light system is fixed 140 mA

Note (1) LED current is measured as shown below.



Note (2) LED life time (Hr) can be defined as the time in which it continues to operate under the condition : $T_a=25\pm 3^\circ\text{C}$, typical I_L value indicated in the above table and $f_L=50\text{kHz}$ until the brightness becomes less than 50%.

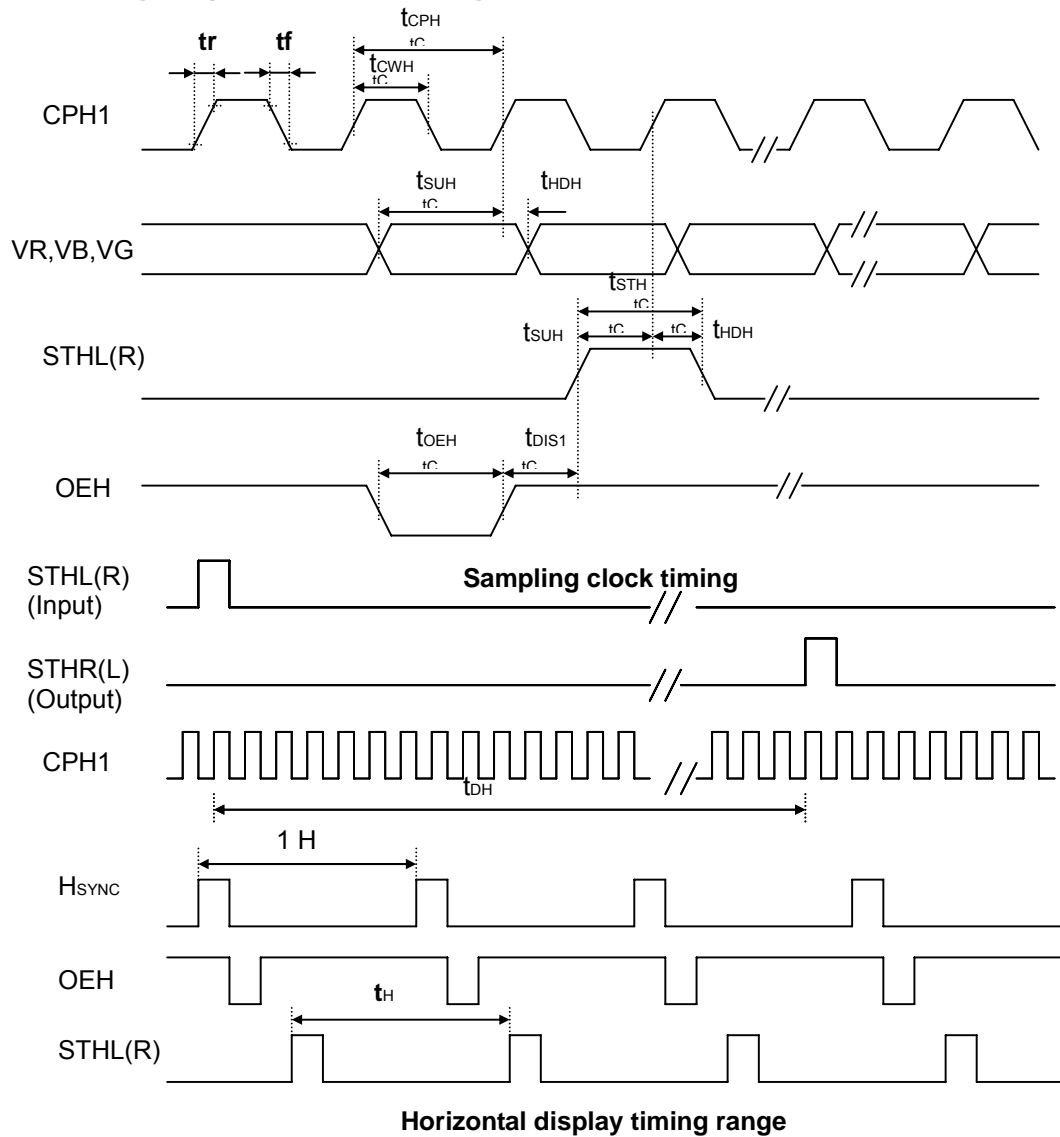
6.3 AC Characteristics

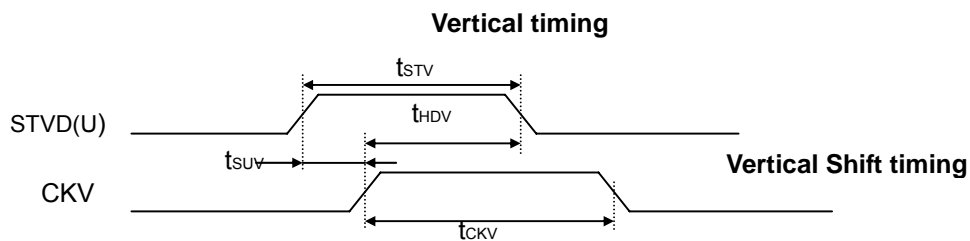
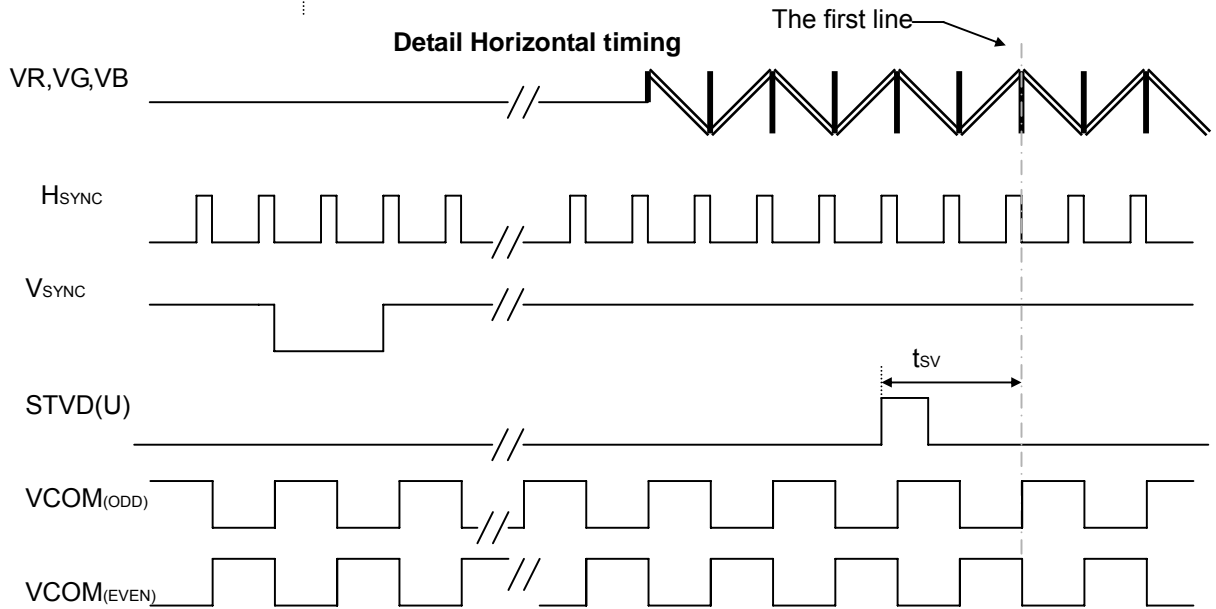
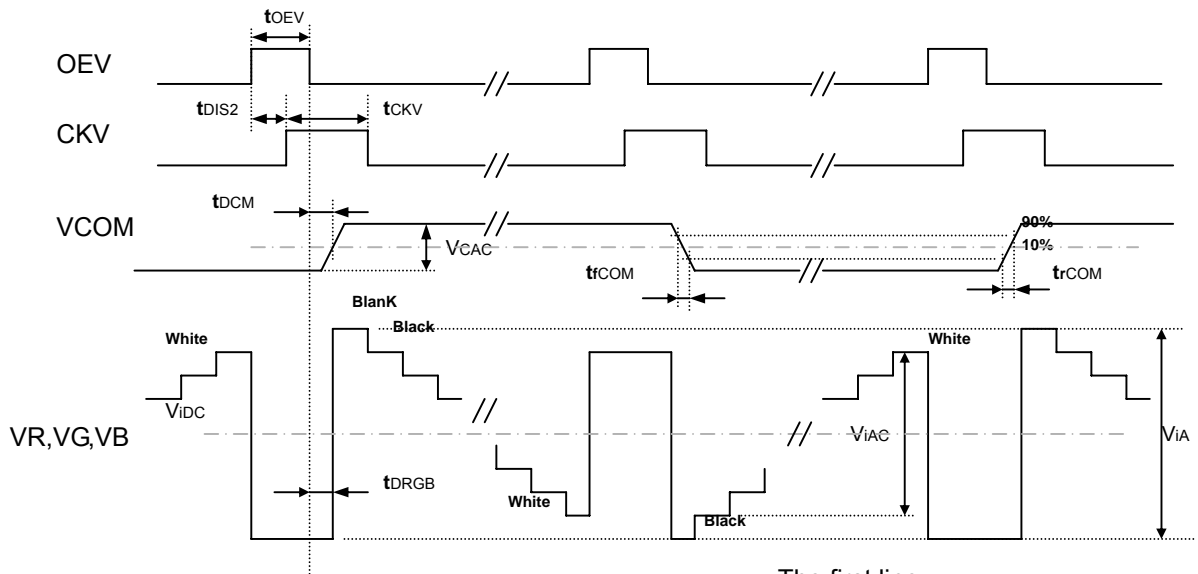
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Rising time	t _r	-	-	10	ns	(1)
Falling time	t _f	-	-	10	ns	(1)
High and low level pulse duty	t _{CPH}	100	103	-	ns	CPH1~CPH3
CPH pulse duty	t _{CWH}	40	50	60		CPH1~CPH3
STH setup time	t _{SUH}	20	-	-	ns	STHR,STHL
STH hold time	t _{HDH}	10	-	-	ns	STHR,STHL
STH pulse width	t _{STH}	-	1	-	t _{CPH}	STHR,STHL
STH period	t _H	61.5	63.5	65.5	μs	STHR,STHL
OEH pulse width	t _{OEH}	-	1.23	-	μs	OEH
Sample and hold disable time	t _{DIS1}	-	8.19	-	μs	
OEV pulse width	t _{OEV}	-	4.77	-	μs	OEV
CKV pulse width	t _{CKV}	-	3.91	-	μs	CKV
Clean enable time	t _{DIS2}	-	3.90	-	μs	
Horizontal display timing range	t _{DH}	-	1440	-	t _{CPH} /3	
STV setup time	t _{SUV}	200	-	-	ns	STVD,STVU
STV hold time	t _{HDV}	300	-	-	ns	STVD,STVU
STV pulse width	t _{STV}	-	1	-	t _H	STVD,STVU
Horizontal line per field	t _V	256	262	268	t _H	(2)
Vertical display start	t _{SV}		3	-	t _H	
Vertical display timing range	t _{DV}		234	-	t _H	
VCOM Rising time	t _{COM}		-	5	μs	
VCOM Falling time	t _{COM}		-	5	μs	
VCOM delay time	t _{DCOM}		-	3	μs	
RGB delay time	t _{DRGB}		*	1	μs	

Note (1): For all of the logic signals.

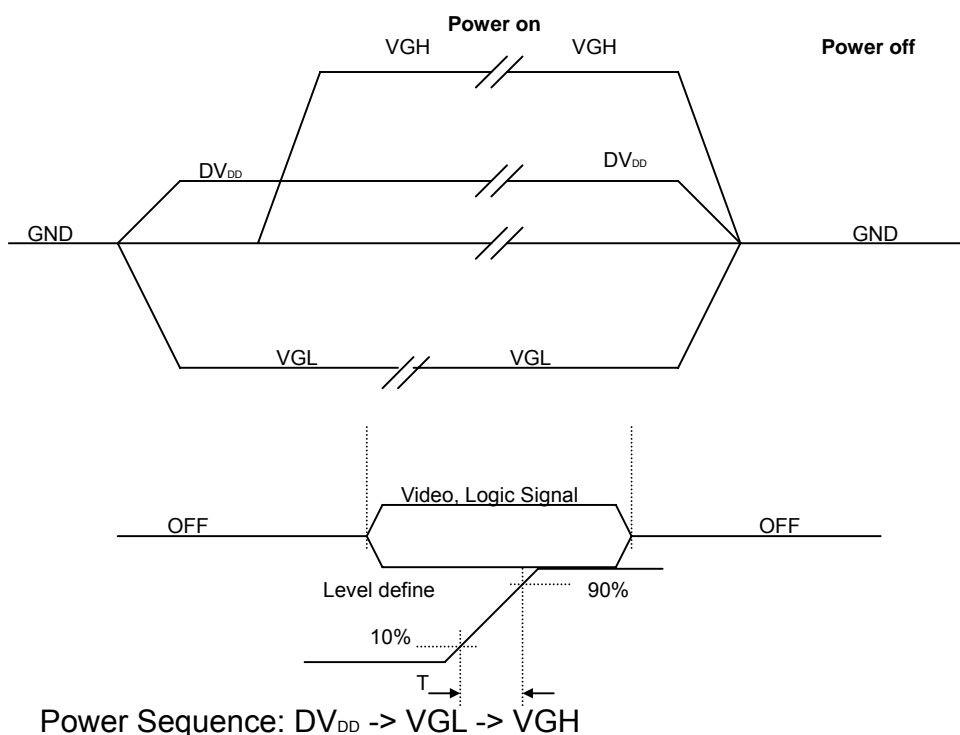
Note (2): Please don't use odd horizontal lines to drive LCD panel for both odd and even filed simultaneously.

6.4 Timing Diagram of Interface Signal





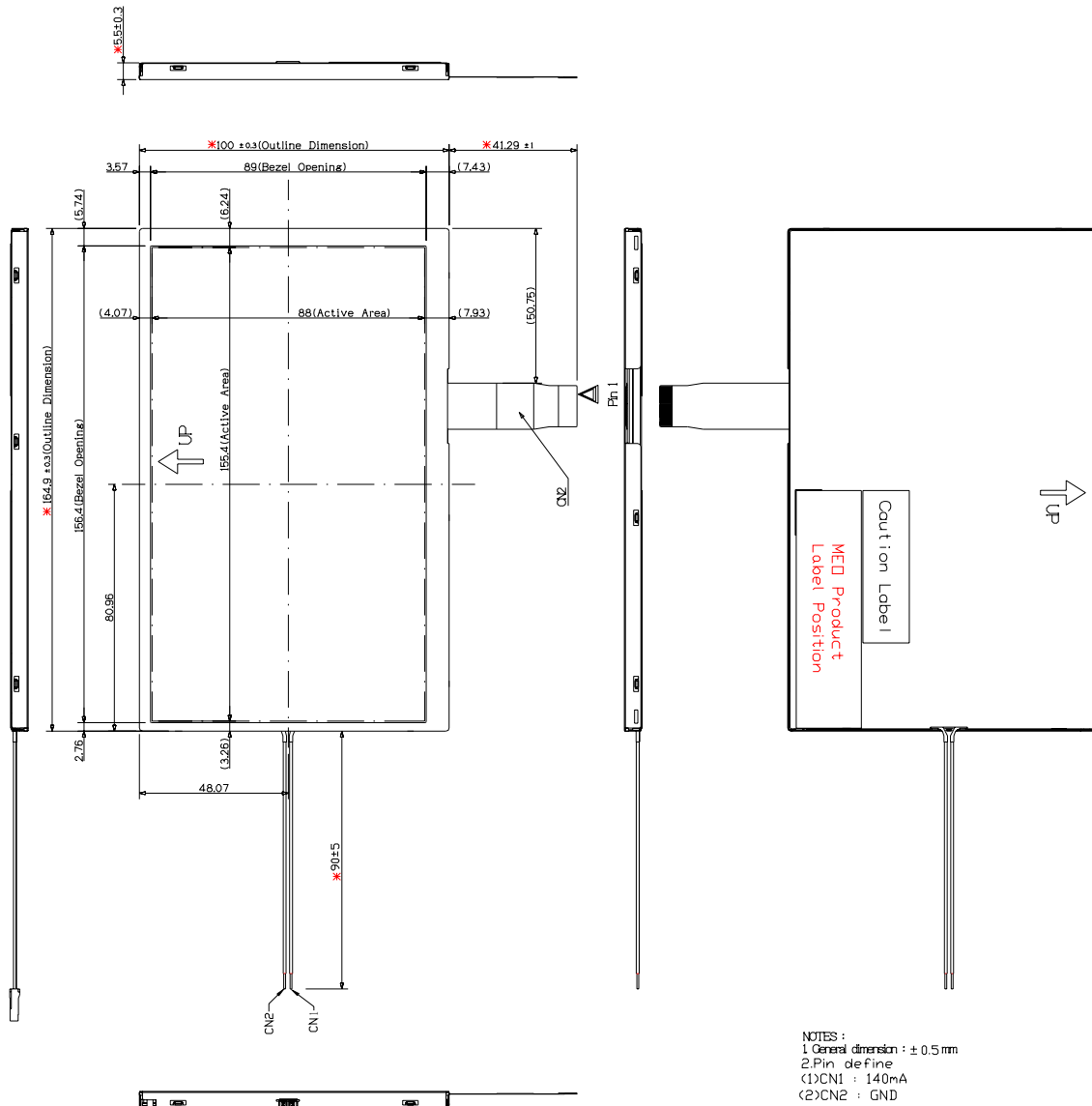
6.5 Power Sequence



Note Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

7.0 OUTLINE DIMENSION

Unit : mm



8.0 GENERAL PRECAUTION

8.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

8.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. MEO does not warrant the module, if customers disassemble or modify the module.

8.3 Breakage of LCD Panel

- 8.3.1. If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 8.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 8.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 8.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

8.4 Electric Shock

- 8.4.1. Disconnect power supply before handling LCD module.
- 8.4.2. Do not pull or fold the CCFL cable.
- 8.4.3. Do not touch the parts inside LCD modules and the fluorescent lamp's connector or cables in order to prevent electric shock.

8.5 Absolute Maximum Ratings and Power Protection Circuit

- 8.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 8.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 8.5.3. It's recommended to employ protection circuit for power supply.

8.6 Operation

- 8.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- 8.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- 8.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

- 8.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.
- 8.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

8.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

8.8 Static Electricity

- 8.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- 8.8.2 Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

8.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

8.10 Disposal

When disposing LCD module, obey the local environmental regulations.