NEWHAVEN DISPLAY INTERNATIONAL

User's Guide

NHD-4.3-480272YF-ATXI#-1

LCM

(Liquid Crystal Display Module)

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Revision History

Date	Rev. No.	Page	Summary
May.16.2006	000		Rev.000 was first issues.
May.25.2006	001	16	Back-Light was inserted.
June.11.2006	002	4	Inversion mode was corrected.
		8	Viewing angle were corrected.
Aug.08.2008	003		Changed pinout to include backlight and touchpanel.

Contents

General Description

*** Description**

NHD-4.3-480272YF-ATXI#-1 is a transmissive type color TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching devices. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit.

The resolution of a 4.3" contains 480x272(RGB) dots and can display up to 16.7M colors.

*** Features**

- triple-gate & Dual ASG
- Transmissive with seven LED backlight
- TN(Twisted Nematic) mode.
- Column inversion mode.
- 24bit RGB Interface
- DE(Data Enable) & SYNC mode - DE, Vsync, Hsync, DOTCLK

*** Applications**

- Display terminals for PMP(Portable Multimedia Player) , Portable CNS(P-CNS) , MP3 application products.
- Display terminals for AV application products.

*** General information**

Items	Specification	Unit	Note
Display area	95.04(H) x 53.856(V) (4.3" diagonal)	mm	-
Driver element	a-Si TFT active matrix	-	-
Display colors	16,777,212	colors	-
Number of dots	480(H) x 272 x RGB(V)	dot	-
Pixel arrangement	RGB stripe	-	-
Pixel pitch	0.198(H) x 0.198(V)	mm	128dpi
Display mode	Normally White	-	-
Viewing direction	6	o'clock	-

*** Mechanical information**

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	105.3	105.5	105.7	mm	-
	Vertical(V)	67.0	67.2	67.4	mm	(1)
	Depth(D)	3.75	3.95	4.15	mm	(1)
Weight		-	TBD	TBD	g	(2)

Note (1) Not include FPC.
Refer to the Outline Dimension in the "8. Outline Dimension" for further information.
(2) Module and Back-light unit are included**.**

1. Absolute Maximum Ratings

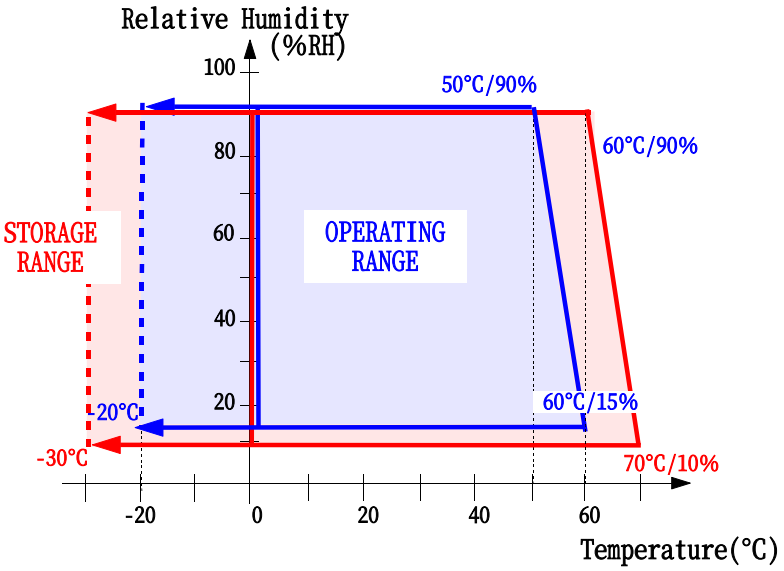
1.1 Absolute Ratings Of Environment

ITEM	MIN	MAX	REMARK
Storage Temperature	-30°C	70°C	Note(1)
Operating Temperature	-20°C	60°C	Note(2)(3)

Note(1) 90%RH maximum humidity, 60°C maximum wet-bulb temperature

(2) When operated at a temperature lower than 0°C, the LCD worked slowly and the screen appeared low-contrast images due to the characteristics of LC(Liquid Crystal).

(3) If any fixed pattern is displayed on LCD for minutes, image-sticking phenomenon may occur.



Temperature & Humidity Graph at Absolute Environment

1.2 Electrical Absolute Ratings

(1) TFT-LCD Module

(Ta = 25 ± 2°C, VSS=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Input voltage	VDD	-0.3	4.6	V	-

(2) Back-Light Unit

(Ta = 25 ± 2°C)

Item	Symbol	Min.	Max.	Unit.	Note
Current	I_B	-	25	mA	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.
Functional operation should be restricted to the conditions described under normal operating conditions.

2. Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).
Measuring equipment: LCD-5000, BM-5A, BM-7, PR-650, EZ-Contrast

(Ta=25 ± 2°C , VDD=3.3V, fv=60Hz , fDCLK=9.2MHz , IL=20mA)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio (Center point)		C/R	NOTE (1)	TBD	400	-	-	(2) BM-5A
Luminance of white (Center point)		Y_L		TBD	350	-	cd/m^2	(3) BM-5A
Response time	Rising	T_R	$\theta = 0$ $\Phi = 0$ Normal Viewing Angle B/L On	-	5	15	msec	(4) BM-7
	Falling	T_F		-	25	30		
Color chromaticity (CIE 1931)	White	Wx		TBD	TBD	TBD	-	(5) PR-650
		Wy		TBD	TBD	TBD		
	Red	Rx		TBD	TBD	TBD		
		Ry		TBD	TBD	TBD		
	Green	Gx		TBD	TBD	TBD		
		Gy		TBD	TBD	TBD		
	Blue	Bx		TBD	TBD	TBD		
		By		TBD	TBD	TBD		
Viewing angle	Hor.	θ_L	C/R≥10 B/L On	75	80	-	Degrees	(6) Ez-Contrast
		θ_R		75	80	-		
	Ver.	Φ_H		55	60	-		
		Φ_L		55	60	-		

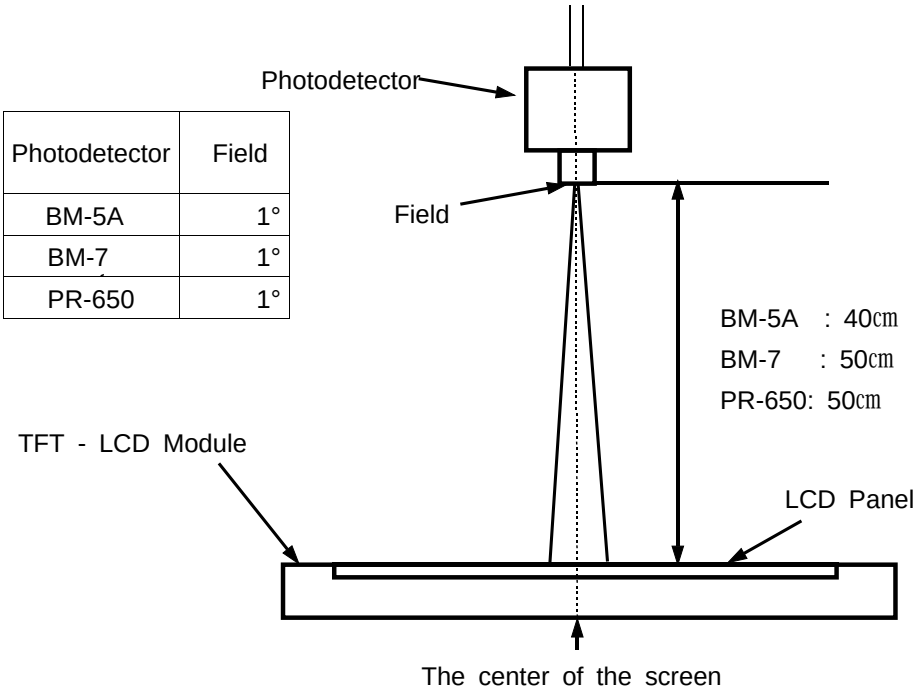
Note (1) Test Equipment Setup

After stabilizing and leaving the panel alone at a given temperature for 30 min , the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. 30 min after lighting the back-light. This should be measured in the center of screen.

Environment condition : Ta = 25 ± 2 °C

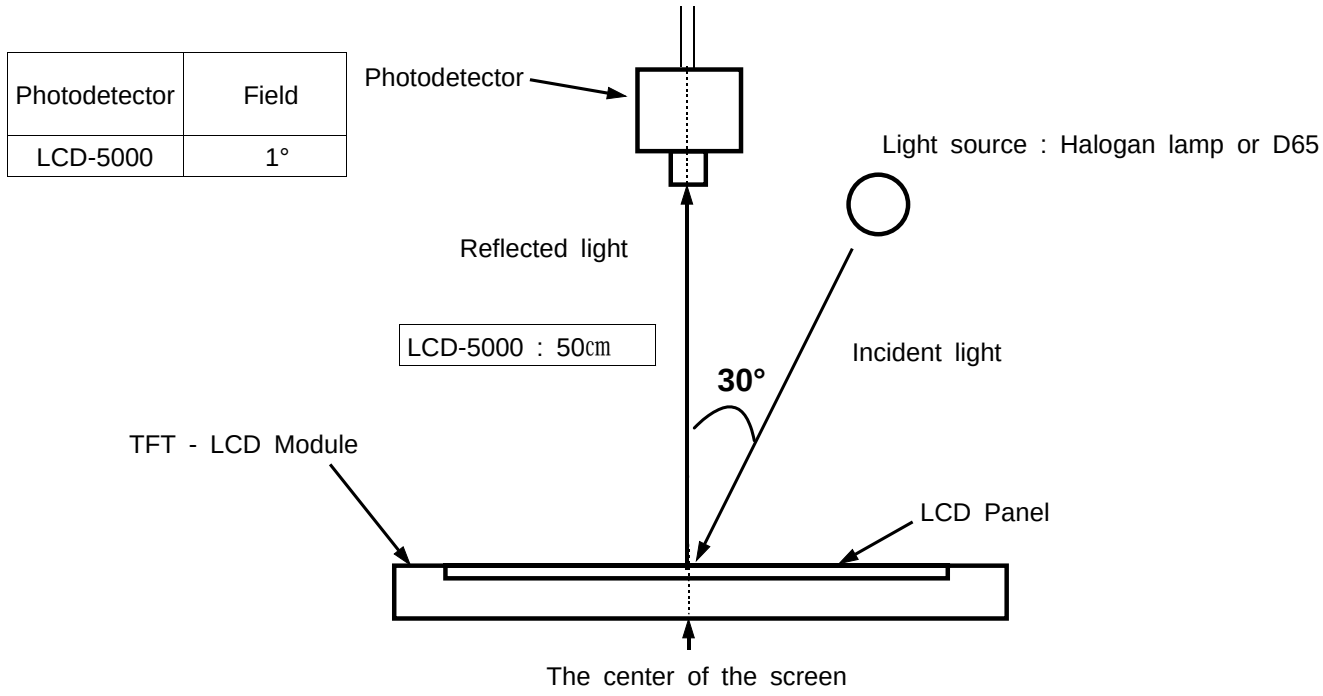
Back-Light On condition

Photodetector	Field
BM-5A	1°
BM-7	1°
PR-650	1°



Back-Light Off condition

Photodetector	Field
LCD-5000	1°



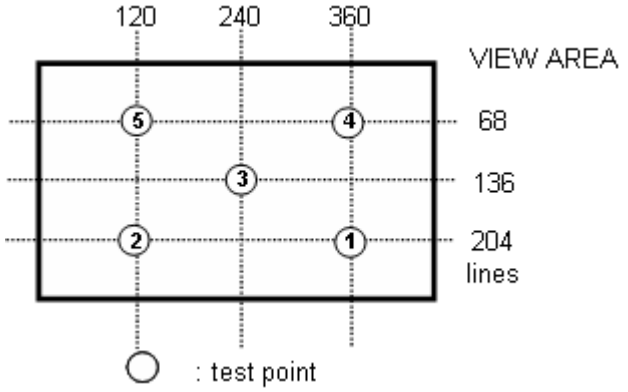
Optical Measuring Equipment Setup

Note (2) Definition of Contrast Ratio (C/R) : Ratio of gray max (Gmax) & gray min (Gmin) at the center point

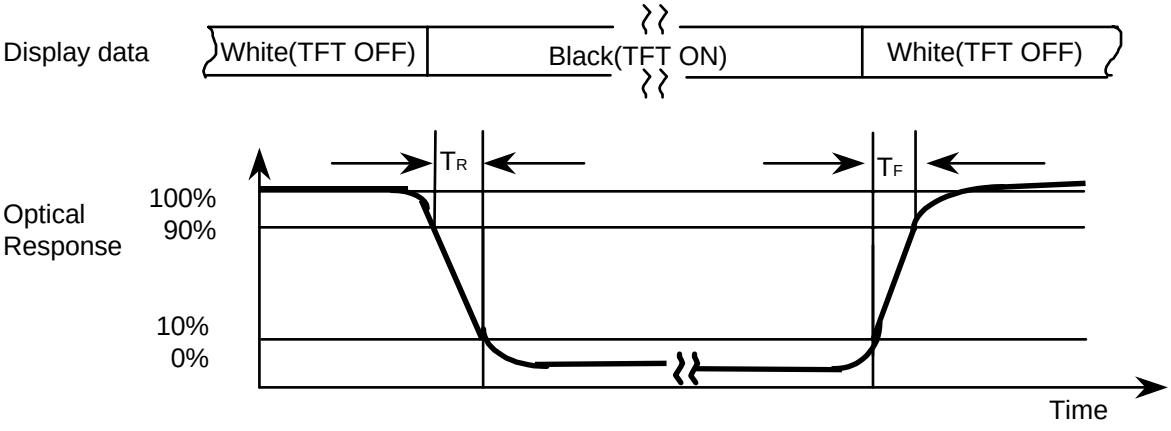
$$CR = \frac{G\max}{G\min}$$

* Gmax : Luminance with all pixels white
* Gmin : Luminance with all pixels black

Note (3) Definition of Luminance of White : Luminance of white at the center point (@③)

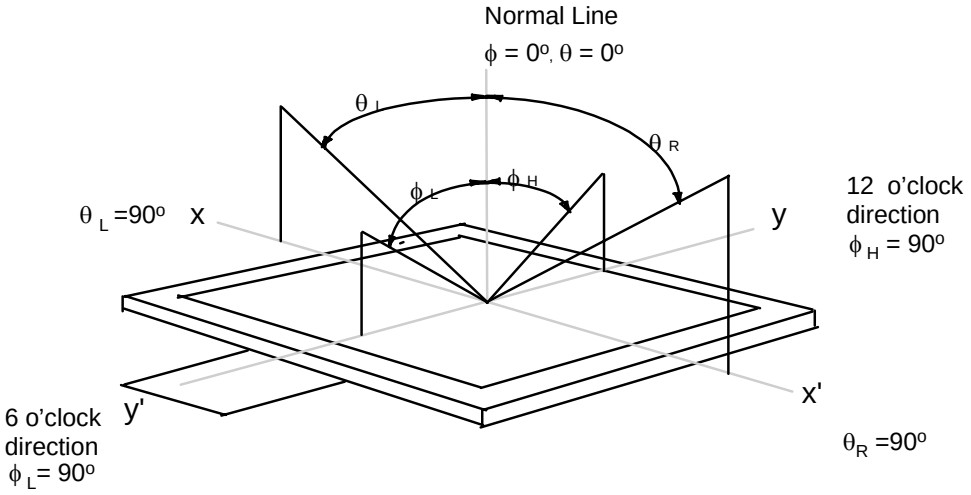


Note (4) Definition of Response time : Sum of Tr ,Tf



Note (5) Definition of Color Chromaticity (CIE 1931)
Color coordinate of white & red, green, blue at center point.

Note (6) Definition of Viewing Angle : Viewing angle range (CR≥1**0**)



3. Electrical Characteristics

3.1 TFT-LCD Module

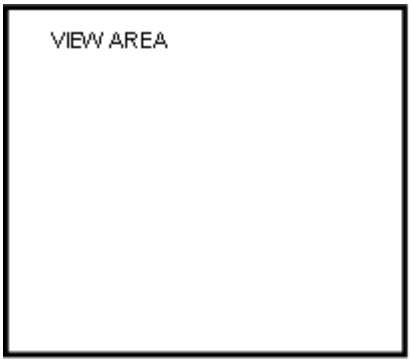
Ta = 25 ± 2°C

ITEM		Symbol	Min.	Typ.	Max.	Unit	Note
Logic supply voltage		VDD	2.9	3.3	3.5	V	
Vsync Frequency		fv	-	60	70	Hz	
Hsync Frequency		f_H	-	17.26	-	kHz	
Main Frequency		f_{DCLK}	-	9.2	15.0	MHZ	
Power Dissipation	White	-	-	80	95	mW	(1),(2)
	Black		-	85	100	mW	

Note (1). f_V=60Hz, f_{DCLK}=9.2MHZ, VDD=3.3V

Note (2). Power Dissipation check pattern

a) White Pattern



b) Black Pattern

3.2 Back-Light unit

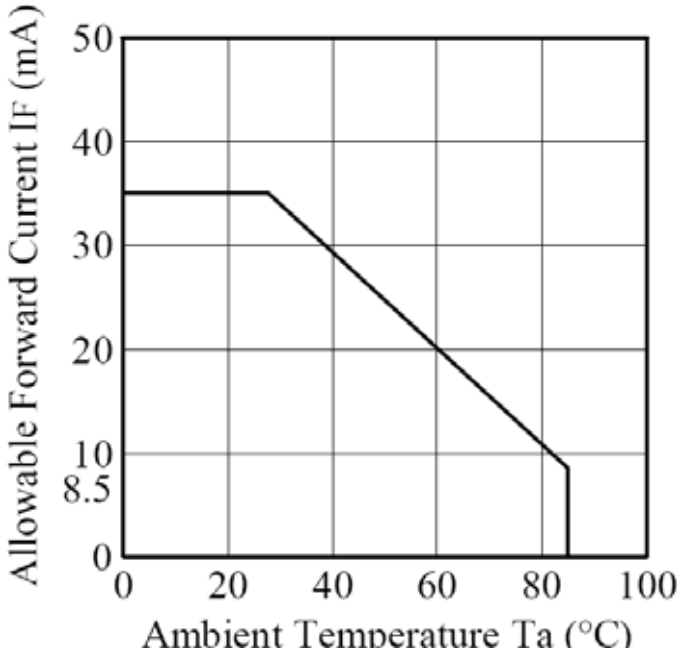
The back-light system is an edge-lighting type with seven white LED(Light Emitting Diode)s.

(Ta=25 ± 2°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LEDs Current	I_B	-	20	TBD	mA	(1)
Power Consumption	P_{BL}	-	480	TBD	mW	(2)

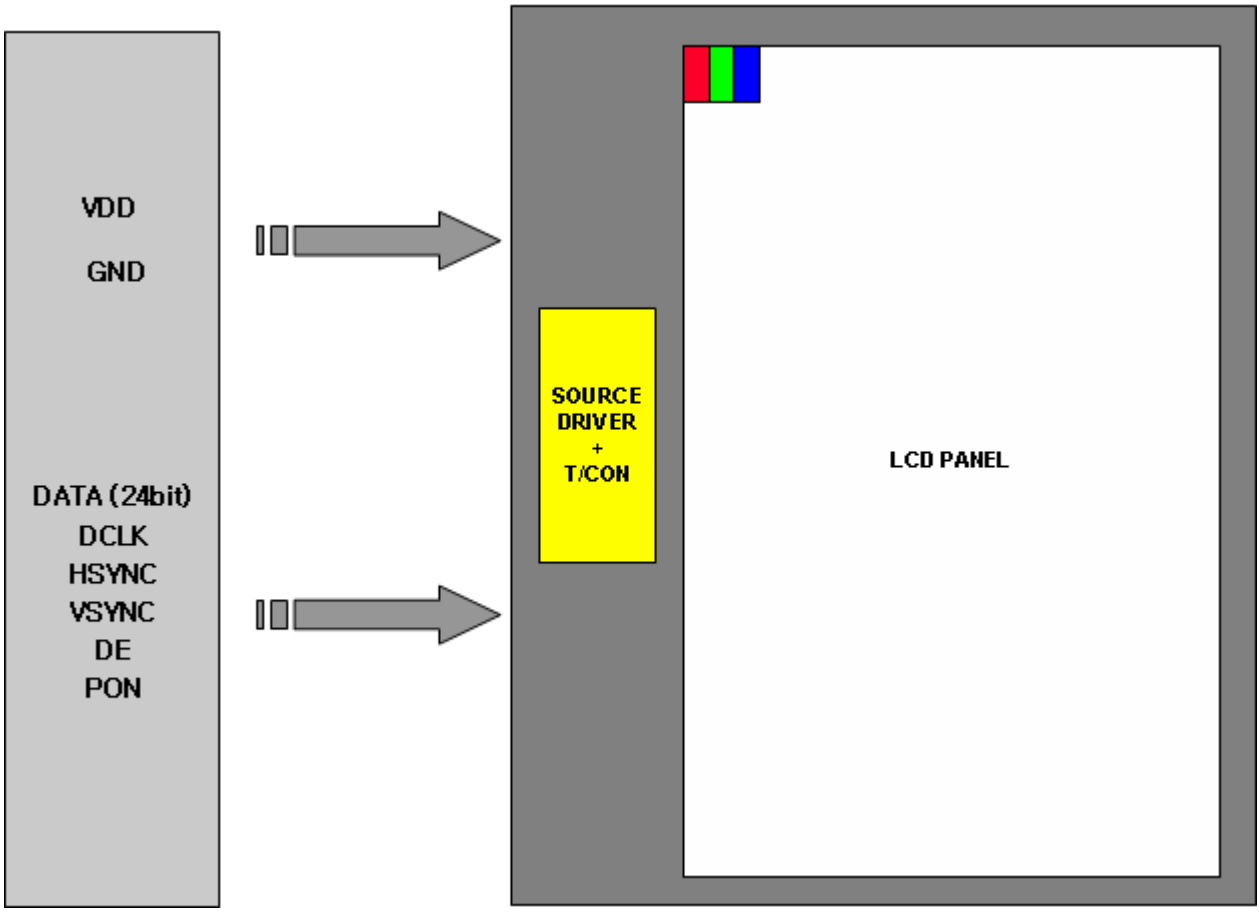
Note (1) Seven LEDs serial type.

(2) Where I_B = 20 mA, V_B = P_{BL} / $_IB$

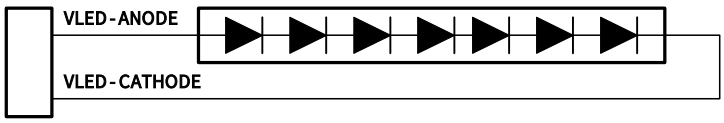


4. Block Diagram

4.1 TFT-LCD Module (Interface System Structure) with Back Light Unit



4.2 Back-light Unit



5. INTERFACE PIN CONNECTIONS

PIN	SYMBOL	FUNCTION
1	LED-	Cathode of LED backlight
2	LED+	Anode of LED backlight
3	GND	Ground for the logic and analog circuit
4	VCC	A power supply for the internal logic circuit and for the I/O circuit
5-12	[R0-R7]	RED data signal
13-20	[G0-G7]	GREEN data signal
21-28	[B0-B7]	BLUE data signal
29	GND	Ground for the logic and analog circuit
30	PCLK	Clock signal to sample each data
31	DISP	Display ON/OFF signal
32	HYSNC	Line synchronization signal
33	VSYNC	Frame synchronization signal
34	DE	Data enable
35	AVDD	A power supply for the internal analog circuit.AVDD=5.0V
36	GND	Ground for the logic and analog circuit
37	XR	No Connect
38	YD	
39	XL	
40	YU	

5.3 Input Signal,Basic Display Colors and Gray Scale of Each Colors

COLOR	DISPLAY	DATA SIGNAL																								GRAY SCALE LEVEL
		RED								GREEN								BLUE								
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	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	-
	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	-
	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	-
	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	-
GRAY SCALE OF RED	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	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	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	R255
GRAY SCALE OF GREEN	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	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:			:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	G3~G252
	↓ LIGHT	:			:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	
		0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	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	G255
GRAY SCALE OF BLUE	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	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252
	↓ LIGHT	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	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	B255

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

5.4 PIXEL FORMAT

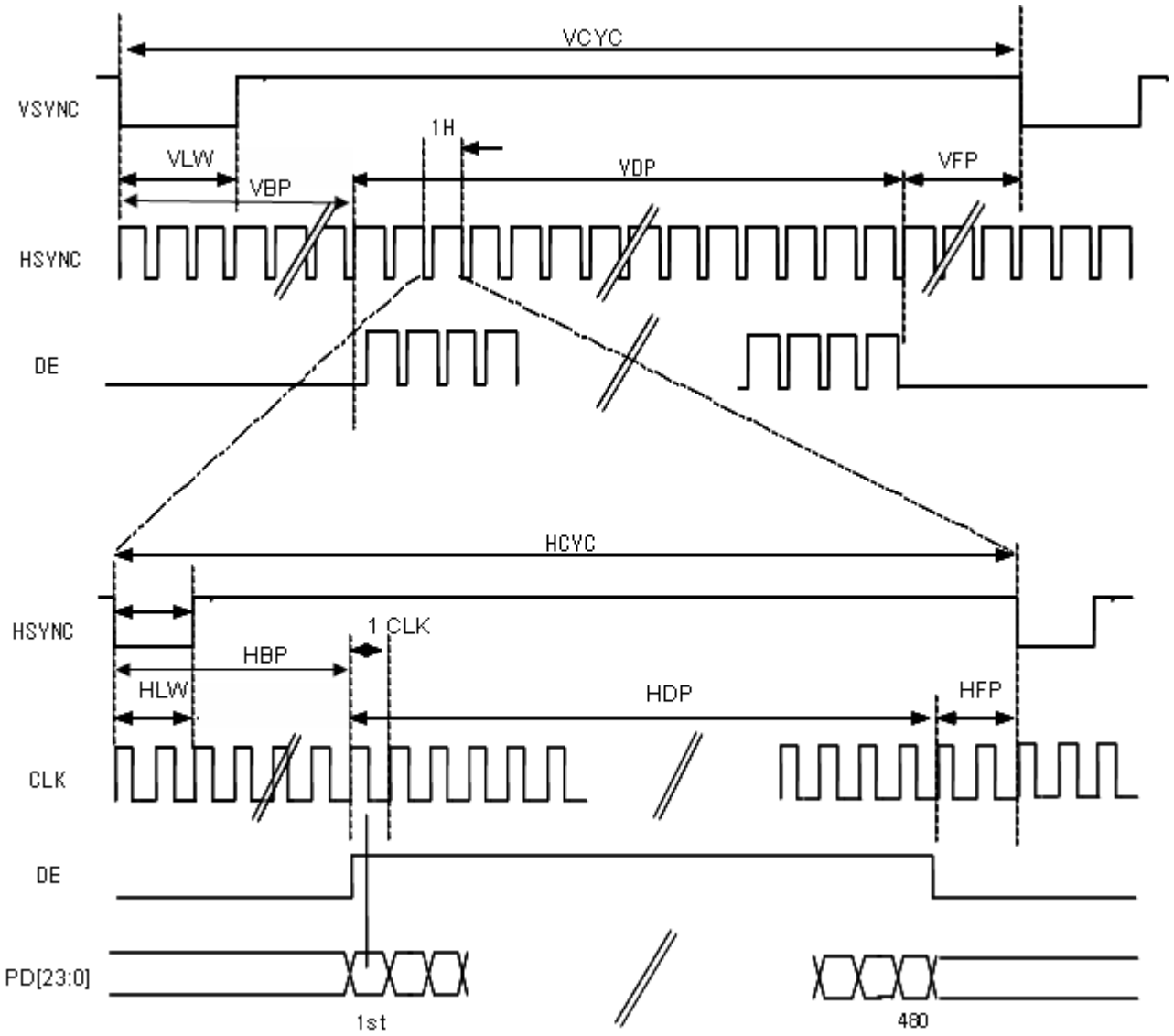
6. INTERFACE TIMING

6-1. Vertical timing

Signal	Symbol	Min.	Typ.	Max.	Unit	Note
Frame Frequency	fFRM	-	60	70	Hz	
VSYNC(Frame) Period	VCYC	239	288	335	H	
VSYNC Low width	VLW	1	10	-	H	
Vertical Display Period	VDP		272	-	H	
Vertical Back porch	VBP	-	12	-	H	
Vertical Front porch	VFP	2	4	-	H	

6-2. Horizontal timing

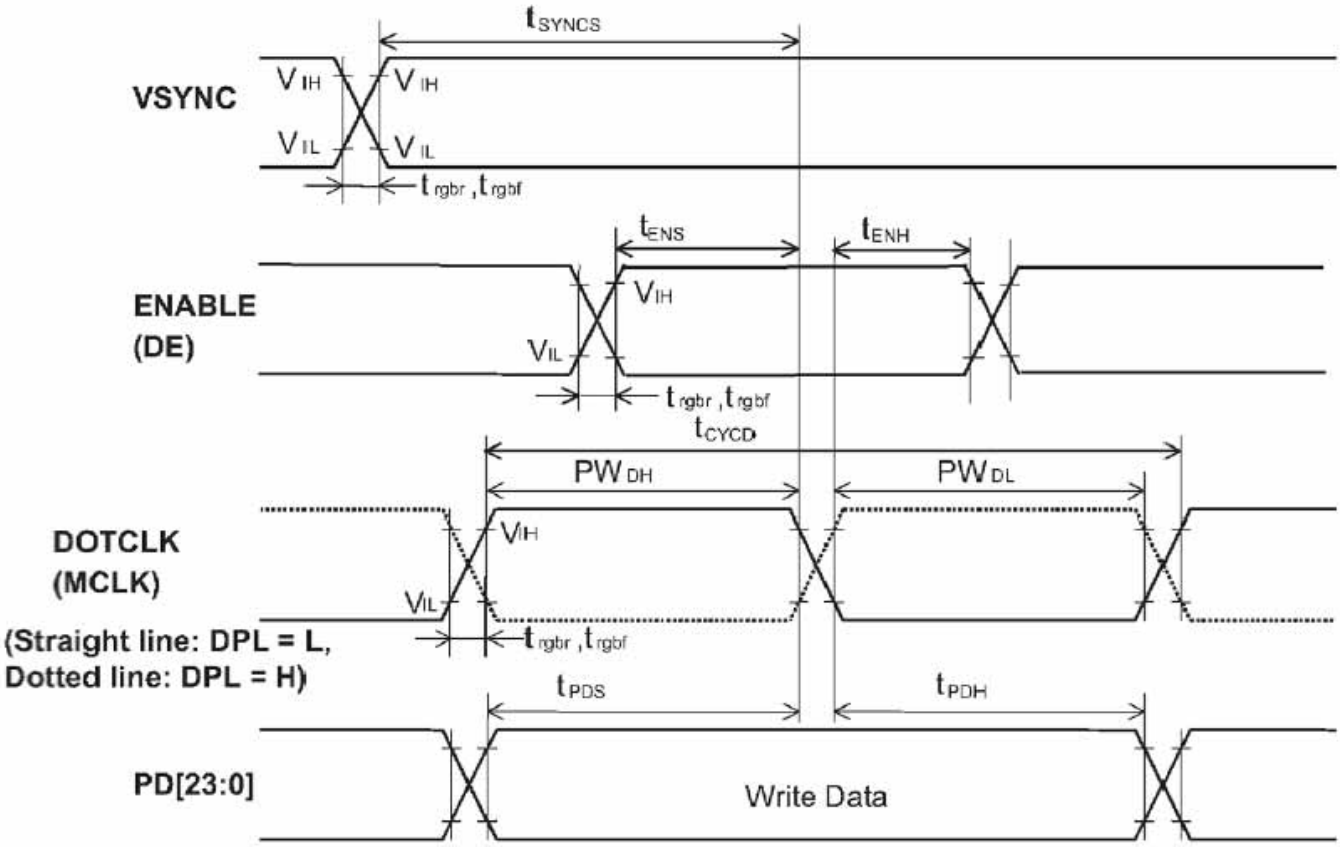
Signal	Symbol	Min.	Typ.	Max.	Unit	Note
HSYNC(1H) Period	HCYC	490	533	605	DOTCLK	
HSYNC Low width	HLW	4	41	-	DOTCLK	
Horizontal Display Period	HDP	-	480	-	DOTCLK	
Horizontal Back porch	HBP	8	45	-	DOTCLK	
Horizontal Front porch	HFP	2	8	-	DOTCLK	
DOTCLK Frequence	f_{DOTCLK}	-	9.2	15	MHz	@fFRM=60Hz


VCYC
VSYNC
1H
VLW
VBP
VDP
VFP
HSYNC
DE
HCYC
HSYNC
1 CLK
HBP
HLW
HDP
HFP
CLK
DE
PD[23:0]
1st
480

6-3. AC characteristics

※ Operating at VDD=2.25~2.9V , Ta = -40℃~+85℃

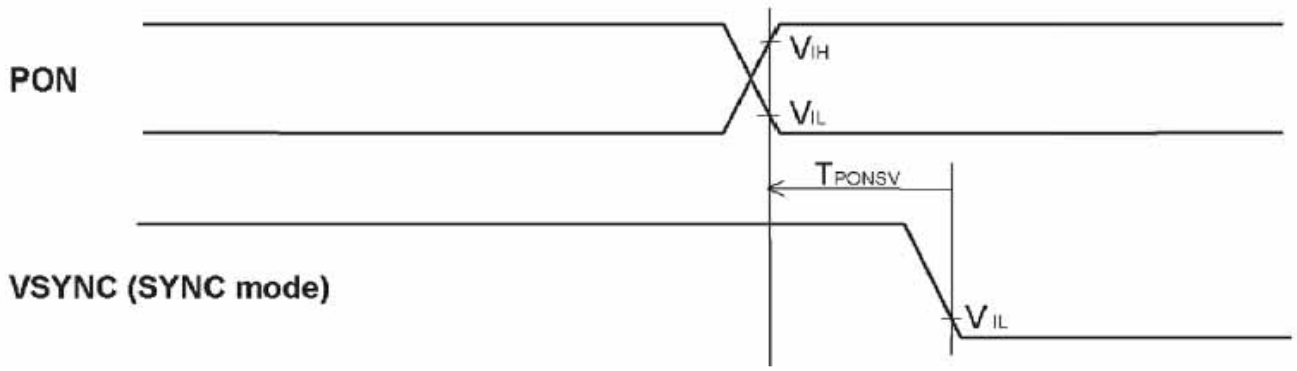
Parameter	Symbol	Min.	Typ.	Max.	Unit
VSYNC,HSYNC setup time	t_{SYNCS}	10	-	-	ns
ENABLE (DE) setup time	t_{ENS}	10	-	-	
ENABLE (DE) hold time	t_{ENH}	10	-	-	
DOTCLK "Low" level pulse width	P_{WDL}	25	-	-	
DOTCLK "High" level pulse width	P_{WDH}	25	-	-	
DOTCLK cycle time	t_{CYCD}	66.7	-	-	
Data setup time	t_{PDS}	10	-	-	
Data hold time	t_{PDH}	10	-	-	
DOTCLK,VSYNC,HSYNC clock rise/fall time	t_{rgbr} t_{rgbf}	-	-	5	


tSYNCS
VSYNC
VIH
VIL
VIH
VIL
trgbr , trgbf
tENS
tENH
ENABLE
(DE)
VIH
VIL
trgbr , trgbf
tCYCD
PWDH
PWDL
DOTCLK
(MCLK)
VIH
VIL
trgbr , trgbf
(Straight line: DPL = L,
Dotted line: DPL = H)
tPDS
tPDH
PD[23:0]
Write Data

6-4. PON timing characteristics.

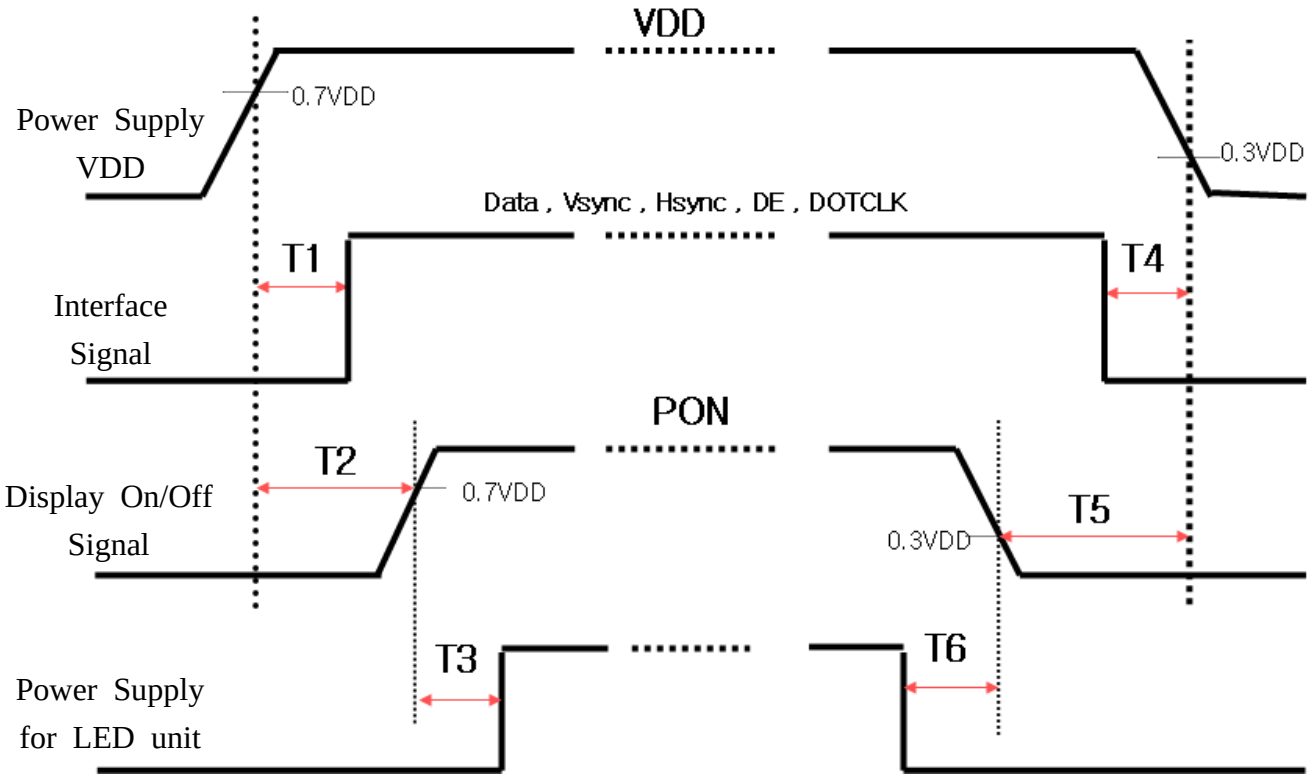
※ Operating at VDD=2.25~2.9V , Ta = -40℃~+85℃

Item	Symbol	Min.	Typ.	Max.	unit
PON setup (SYNC mode)	t_{PONSV}	10	-	-	DOTCLK



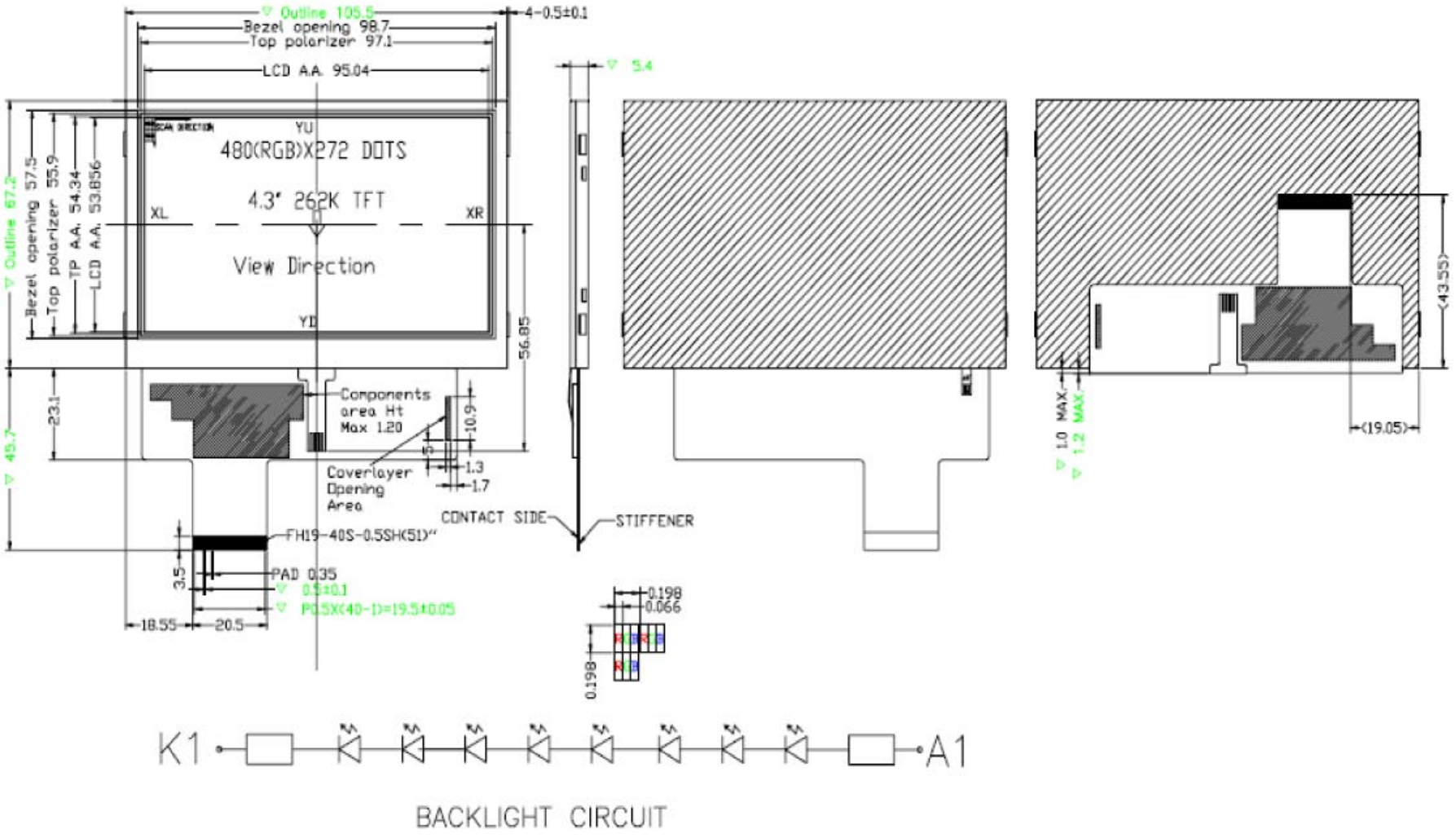
7. Power On/Off Sequence

- To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



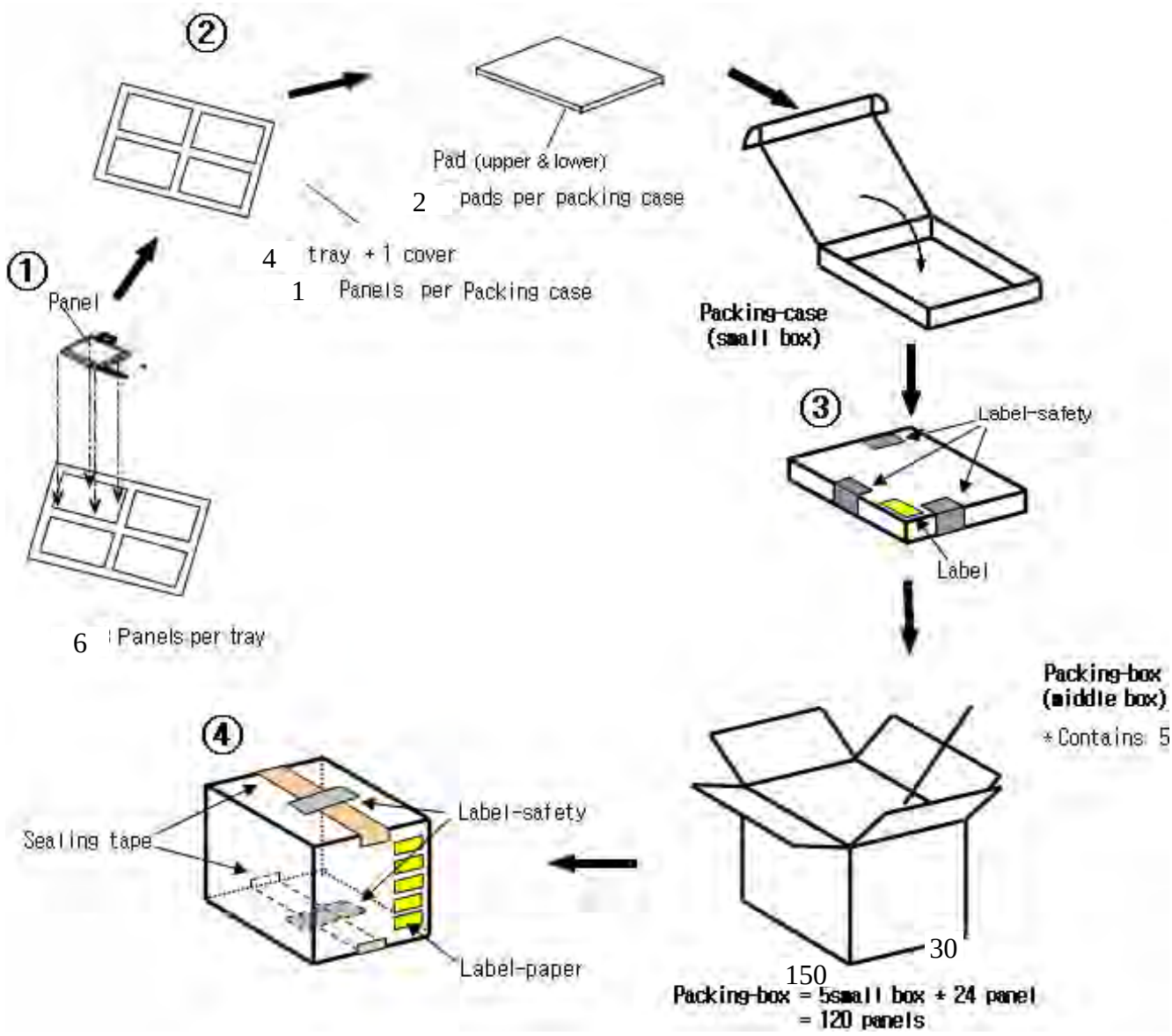
Symbol	Specification	Note
T1	0 ms < T1 < T2	
T2	5 ms < T2	(1)
T3	10 frames < T3	
T4	10 ms < T4 < T5	
T5	(5 frames + T4) < T5	(1)
T6	10 frames < T6	

Note(1) Refer to "6-4. PON timing characteristics."



BACKLIGHT CIRCUIT

9. Packing



Note

(1) Total : Case: Approx. : TBD Kg
Box: Approx. : TBD Kg

(2) Size : Case: 490(W) x 342(D) x 58(H)
Box: 505(W) x 355(D) x 312(H)

(3) Place the panels in the tray facing the direction shown in the figure.

(4) Place 4 tray and cover(empty tray) and pads inside the packing-case.

(5) Place 5 packing-case inside the packing-box. (Affix the label)

(6) Seal the packing-box. Affix the label-safety.

10. Others

11. General Precautions

11.1 Handling

(a) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.

(b) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(c) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.

(d) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.

(e) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(f) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(g) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

(h) Protect the module from static , it may cause damage to the Integrated Gate Circuit.

(i) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(j) Do not disassemble the module.

(k) Do not adjust the variable resistor which is located on the back side.

(l) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(m) Pins of I/F connector shall not be touched directly with bare hands

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Newhaven Display:

NHD-4.3-480272YF-ATXI#-1