

TFT Module Tentative Product Specification

MODEL NO.:NMA43WQ65-A1-T01

Customer:

Proposed by		Approved by
Designed	Approved	

Revision History

Rev.	Date	Content	Modified by
Ver 0.0	2007/02/07	Tentative Product Specification is first issued.	
Ver 0.1	2007/02/13	The view angle is corrected.	
Ver 0.2	2007/03/10	The model name is changed. “ NMA43-WQ65-A1F1 “ → “ NMA43WQ65-A1-T01” The Touch Screen Panel Specification is added.	

Contents

NO.	ITEM	PAGE
1.	Scope	4
2.	General Features	4-5
3.	Absolute Maximum Ratings	6
4.	Electrical Characteristics	6
4.1	TFT-LCD Module	6
4.2	Back-light Unit	7
4.3	Touch Screen Panel	8 - 10
5	Block Diagram	11
6	Input Pin Assignment	12
7	Operation Specification	13
7.1	Power on/off sequence	13
7.2	Reset Timing	13
7.3	Horizontal / Vertical Timing	14-15
8	AC Characteristics	16
8.1	AC Characteristics	16
8.2	Waveform	17
9	Optical Characteristics	18-20
10	Outline Dimension	21
11	Reliability Test	22
12	Packing & Form	23
13	Precautions	24-25

1. Scope

This specification defines design and performance criteria for a color, transmissive mode, active matrix, liquid crystal display (LCD) Panel using amorphous silicon thin film transistor (TFT) technology. The intended application for this module is for the display of text and graphic information and is suitable for use in Multimedia Player products produced for and sold by Nanovision.

This document defines the requirements for the design and qualification of the LCD Module described here in. It is not necessary that each parameter specified in this document be tested in a production environment. The test equipment and procedures described herein are for design verification and not meant to indicate what equipment will be used in the production facility.

* Applications

PMP(Personal Multimedia Player), Digital AV Products.

2. General Features

- Transmissive type and back-light with 10 LEDS (2Parallel).
- Support Resolution 480xRGBx272 (16.7M Color)
- Interface Method
24bit parallel RGB I/F + Serial RGB I/F (8bit x 3).
- Good Reliability. (Apply Metal Chassis)
- High Color Purity: 50%
- High Brightness: 350cd/m² (typ).
- Ultra Low Power consumption
- Touch Screen Panel (Analog Resistive type).
Double / Clear typ.
- RoHS compliant.

*** General Specification**

PARAMETER	SPECIFICATIONS	UNIT
DISPLAY MODE	Transmissive	-
DISPLAY SIZE(DIAGONAL)	4.3	Inch
DISPLAY OPERATION MODE	Normally White	
DRIVER ELEMENT	a-Si TFT active matrix	
ACTIVE AREA (H x V)	95.04 x 53.856	mm
MODULE DIMENSION (H x V x T)	105.4 x 67.1 x 4.44	mm
PANEL OUTLINE DIMENSION (H x V)	102.04 x 63.006	mm
NUMBER OF DOTS	480 x RGB x 272	dot
PIXEL PITCH (H x V)	0.198(0.066)x0.198	mm
PIXEL ARRANGEMENT	Stripe type	-
NUMBER OF COLORS	16.7M	Colors
COLOR PURITY	50	%
DRIVER IC	HX8655 (Gate) x 1, HX8266 (Source) x 2	
VIEWING DIRECTION	6 o'clock	-
RESPONSE TIME (Tr + Tf)	70(Max)	ms
CONTRAST RATIO	250:1	-
TOUCH SCREEN PANEL	Analog Resistive type	

3. Absolute Maximum Ratings

(V_{ss} = 0V)

Item	Symbol	Min.	Max.	Unit	Note
Supply voltage(1)	VDD	-0.3	6.0	V	1),2)
Supply voltage(2)	AVDD	-0.3	6.0		
Operation temperature	TOP	-20	70	℃	-
Storage temperature	TST	-30	80		-
Humidity	-	-	90	%RH	-

Note 1) V_{cc} and AVDD are based on V_{ss} (0V).

Note 2) If voltage supply exceeds absolute maximum rating, LSI may be damaged permanently.

It is desirable to use these LSIs under electrical characteristic conditions during operating.

Otherwise, these LSIs may cause malfunctions or reduced reliabilities.

Note 3) 90% RH maximum humidity, 60℃ maximum wet-bulb temperature.

4. Electrical Characteristics

4.1 TFT-LCD Module

(V_{ss} = 0V, T_a = -20 ~ 70℃)

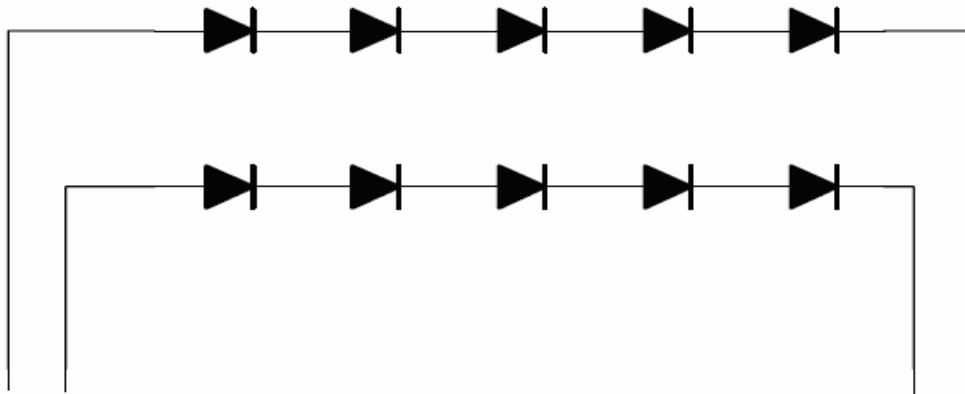
Item	Symbol	condition	Min.	Typ.	Max.	Unit	Note
Supply voltage	VDD	-	2.25	3.0	3.6		-
Supply voltage	AVDD	-	4.8	5	5.2	V	
Frame Frequency		-		62.5		Hz	

4.2 Back-light Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Current	IB	-	20	-	mA	(1)

Note (1) 10 LEDs serial type.

- (2) 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.



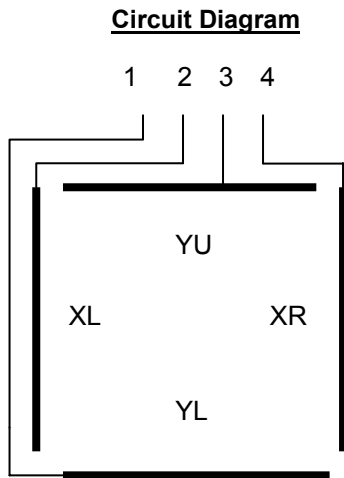
4:A(+) 3:A1(+)

2:C1(-) 1:C(-)

No	Pin Connection	
1	Cathode (C)	C (-)
2	Cathode (C1)	C1 (-)
3	Anode (A1)	A1 (+)
4	Anode (A)	A (+)

4.3 Touch Screen Panel

4.3.1 TSP Circuit Diagram & Signal Assignment



Signal Assignment

Pin No.	Signal
1	YL
2	XL
3	YU
4	XR

4.3.2 Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal resistance	200	-	900	Ω	X1 ~ X2
	200	-	900	Ω	Y1 ~ Y2
Insulation resistance	20	-	-	M Ω	DC25V
Voltage	-	-	7	V	DC
Chattering	-	-	10	ms	100K Ω Pull-up
Transparency	-	80	-	%	JIS-K7105

Caution (1) : Do not operate it with a thing except a polyacetal(tip R0.8mm or more) or a finger, especially Those with hard or sharp tips such as a ball point pen or a mechanical pencil.

4.3.3 Mechanical & Reliability Characteristics

Item		Min.	Typ.	Max.	Unit	Note
Activation force	stylus	-	-	110	g	(1)
	finger			110		
Durability (Writing friction)		Write 100,000	-	-	characters	(2)
Durability (Finger touches)		1,000,000	-	-	touches	(3)
Surface hardness		3	-	-	H	JIS K5400

Note (1) Stylus pen input : R0.8mm polyacetal pen or Finger

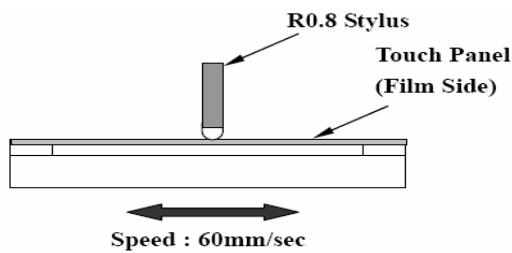
(2) Measurement for Surface area

- Write 100,000 capital or small alphabetical characters with a stylus in an area 20mm x 20mm
- Loads : 250gf
- Speed : 60mm/sec
- Pen : 0.8R polyacetal stylus
- Measurement position : Center of Touch Panel

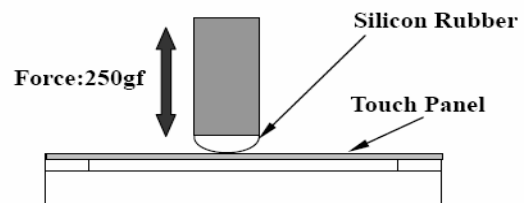
(3) Punching 1,000,000 times with a silicon rubber R0.8, hardness of 60°.

- Force : 250g.
- Speed : 2times/sec

Writing friction



Finger touches

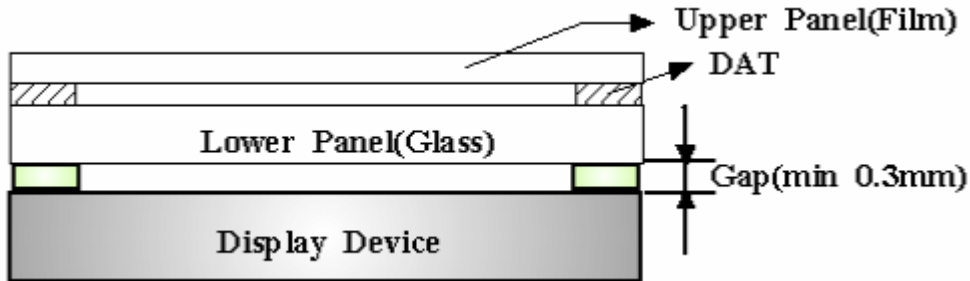


4.3.4 TSP Reliability

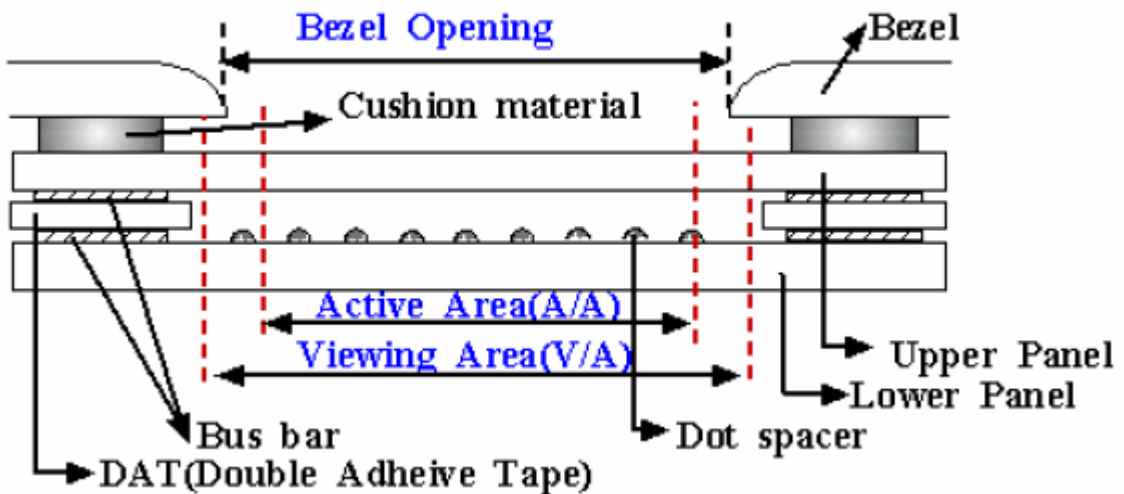
Item	condition	Remark
Operation temperature	-20℃ ~ +60℃	(No Condensation)
Operation humidity	Less than 90% RH	"
Storage temperature	-30℃ ~ +70℃	"
Storage humidity	Less than 90% RH	"

4.3.5 Housing design

- Keep the gap(over 0.3mm) between the touch panel and flat-panel display to protect a display device.



- Keep the gap(over 0.3mm) between the bezel edge and touch panel surface.
 The reason is to prevent the bezel from contacting touch panel surface which may cause a short with the bottom layer.
- We recommend the use of a cushion material between the touch panel and the bezel.

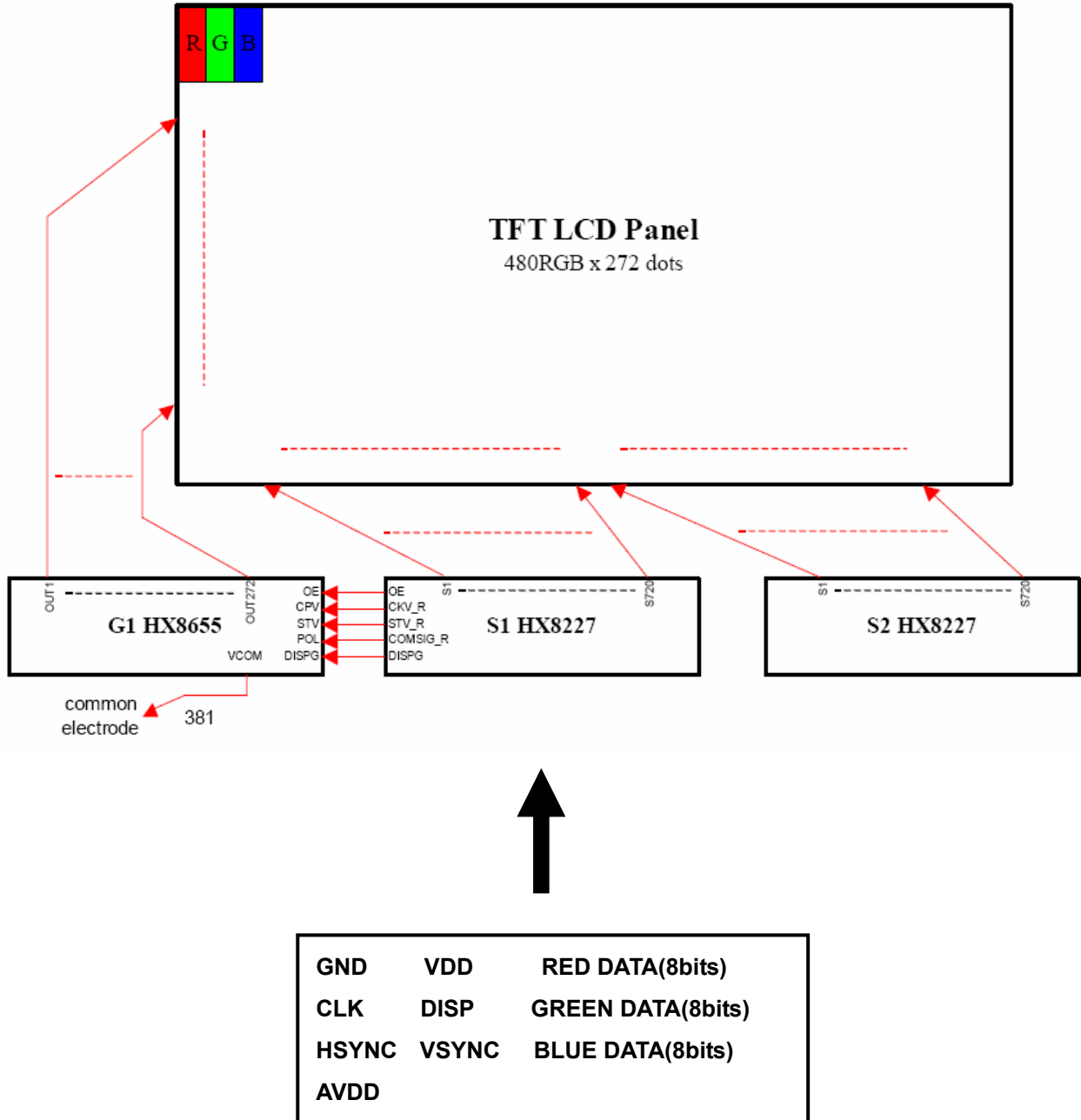


- The cushion material should be limited only on the busbar area.
 If it is out the busbar area, a short may occur.

4.3.6 Operation

- Please do not operate touch panels by applying excessive force.
- Please do not use a sharp things except finger or R0.8 polyacetal.
- We recommend calibration after long term use tip pen for input.

5. Block Diagram



6. Input Pin Assignment

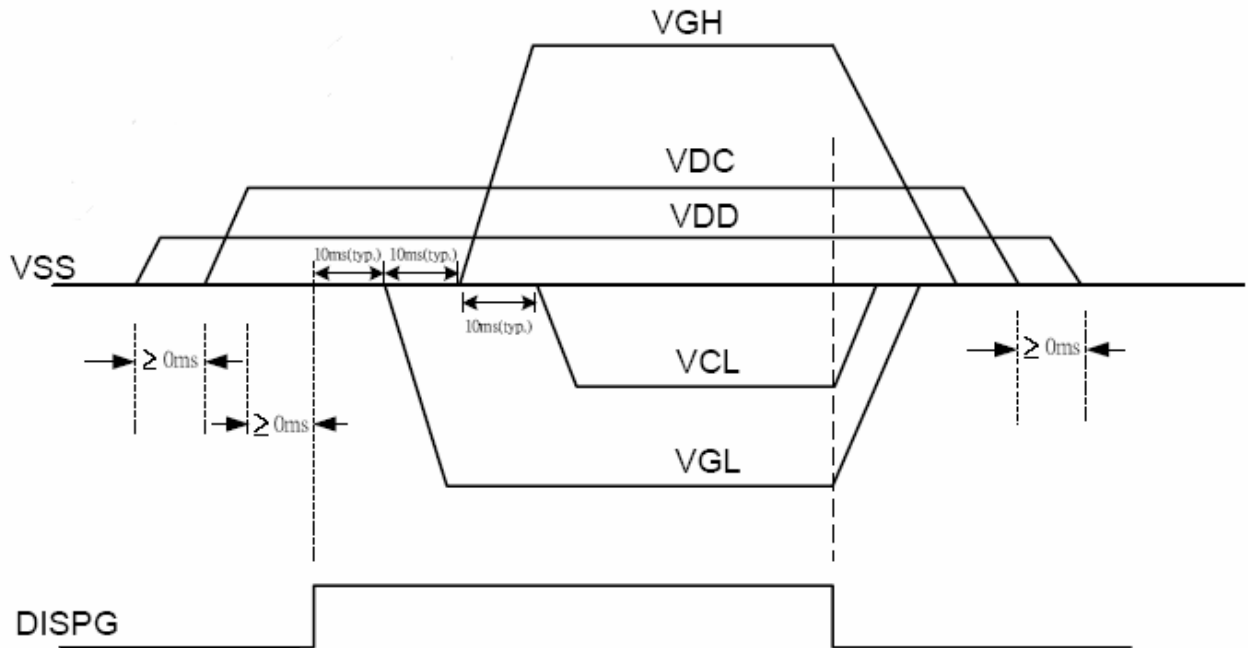
NO	Symbol	Description	NO	Symbol	Description
1	LED_K	POWER FOR LED	21	B0	BLUE DATA(LSB)
2	LED_A	POWER FOR LED	22	B1	BLUE DATA
3	GND	GROUND	23	B2	BLUE DATA
4	VDD	POWER SUPPLY (DIGITAL: +3.0V)	24	B3	BLUE DATA
5	R0	RED DATA(LSB)	25	B4	BLUE DATA
6	R1	RED DATA	26	B5	BLUE DATA
7	R2	RED DATA	27	B6	BLUE DATA
8	R3	RED DATA	28	B7	BLUE DATA (MSB)
9	R4	RED DATA	29	GND	GROUND
10	R5	RED DATA	30	CLK	CLOCK
11	R6	RED DATA	31	DISP	DISPLAY ON/OFF
12	R7	RED DATA(MSB)	32	HSYNC	HORIZONTAL SYNC
13	G0	GREEN DATA(LSB)	33	VSYNC	VERTICAL SYNC
14	G1	GREEN DATA	34	DEN	DATA ENABLE
15	G2	GREEN DATA	35	AVDD	POWER SUPPLY (ANALOG: +5V)
16	G3	GREEN DATA	36	GND	GROUND
17	G4	GREEN DATA	37	XR(X1)	RIGHT SIDE TOUCH PANEL
18	G5	GREEN DATA	38	YL(Y1)	BOTTOM SIDE TOUCH PANEL
19	G6	GREEN DATA	39	XL(X2)	LEFT SIDE TOUCH PANEL
20	G7	GREEN DATA (MSB)	40	YU(Y2)	UP SIDE TOUCH PANEL

7. Operation Specifications

Please refer to HX8655 / HX8227 datasheet for more details

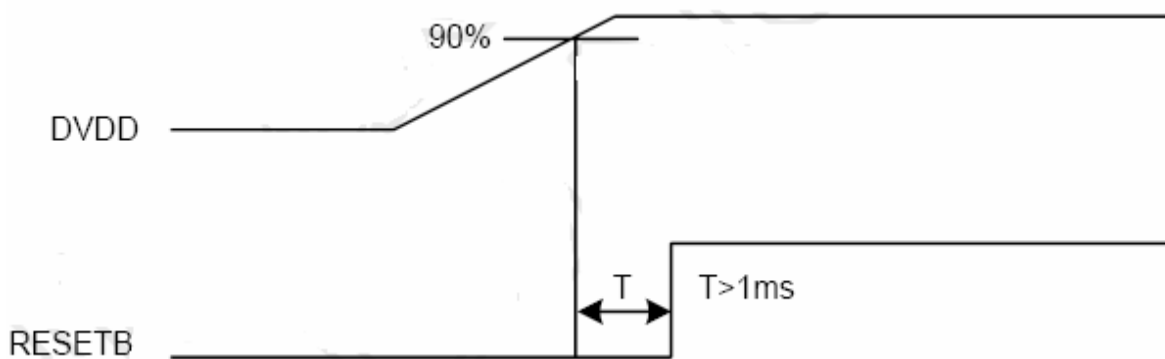
7.1 Power on/off sequence

TO prevent the device damage from latch up, the power on / off sequence shown below.
 the sequence of VGL, VGH and VCL is controlled by HX8655-A itself.



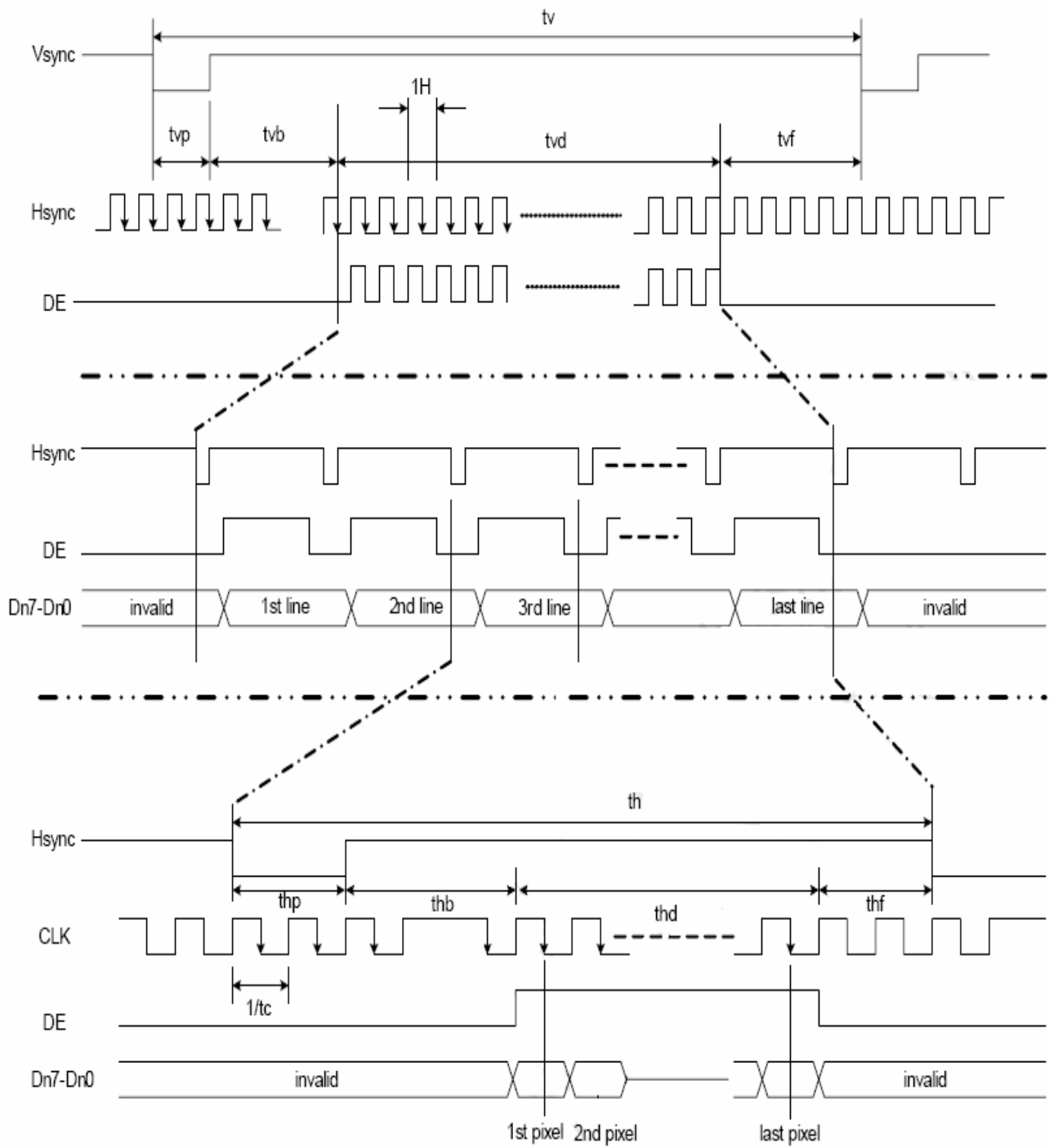
7.2 RESET TIMING

HX8227-A is internally initialized by the global reset signal, RESETB.
 The reset input must be held for at least 1ms after power is stable.



7.3 Horizontal / Vertical Timing

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	1/tc	-	9	15	MHz
Hsync cycle	1/fh	-	17.14	-	Khz
Vsync cycle	1/fv		59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	-	525	-	CLK
Horizontal display period	thd	-	480	-	CLK
Horizontal front porch	thf	2	-	-	CLK
Horizontal pulse width	thp	2	41	-	CLK
Horizontal back porch	thb	2	2	-	CLK
Vertical Signal					
Vertical cycle	tv	-	286	-	H
Vertical display period	tvd	-	272	-	H
Vertical front porch	tvf	1	2	-	H
Vertical pulse width	tvp	1	10	-	H
Vertical back porch	tvb	1	2	-	H



8. AC Characteristics

8.1 AC Characteristics

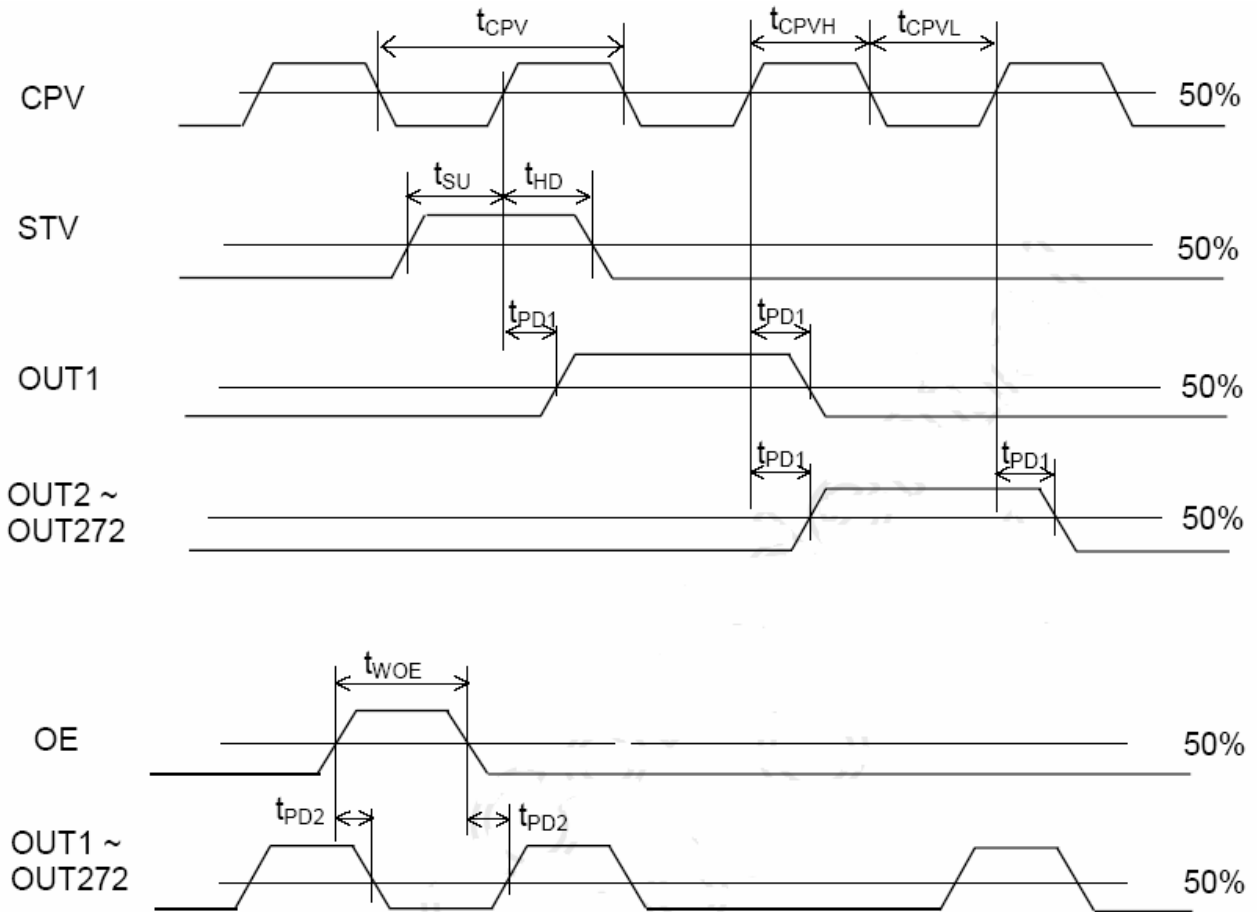
(VDD=2.25V to 3.6V, VDC=5V, VSS=0V, VGH=4*VDC, VGL=-2VDC, VCL=-1*VDC)

PARAMETER	Symbol	Condition	Min.	Typ.	Max.	Unit
Oscillation Frequency	fosc		130	200	250	KHz
VCOM output rise Time (1)	tcomr	CL=100nF			32	us
VCOM output fall Time (2)	tcomf	CL=100nF			32	
CPV period	tcpv	-	5	-	-	
CPV period width (3)	tcpvh, tcpvl	50% duty	2.5	-	-	
CPV pulse width	twoe	-	1	-	-	
Data setup time	tsu	-	0.2	-	-	
Data hold time	thd	-	0.3	-	-	
CPV to output delay time	tpd1	CL=220pF	-	-	0.9	
OE to output delay time	tpd2	CL=220pF	-	-	0.8	

Note: (1) 10 to 90% of (COMH-COML)

(2) 90 to 10% of (COMH-CIML)

(3) For non 50% duty cycle application, min. CPV pulse width tcpvh=0.7us

8.2 Waveform


9. Optical Specification

Item	Symbol	Condition	Specification			Unit	Note		
			Min.	Typ.	Max.				
Transmittance	T%	Viewing normal angle $\theta_x = \theta_y = 0^\circ$	-	7.5	-	%	All left side data are based on following condition NTSC: 50% Light: C Light (BM5A)		
Contrast Ratio	CR		150	250	-	-		1)	
Response Time	T_R		-	15	20	ms		2)	
	T_F		-	35	50	ms			
Chromaticity	Red		X_R	0.585	0.615	0.645		-	4),5)
			Y_R	0.314	0.344	0.374		-	
	Green		X_G	0.277	0.307	0.337		-	
			Y_G	0.532	0.562	0.592		-	
	Blue		X_B	0.103	0.133	0.163		-	
			Y_B	0.120	0.150	0.180		-	
	White	X_W	0.279	0.309	0.339	-			
		Y_W	0.320	0.350	0.380	-			
Viewing Angle	Hor.	θ_{x+}	-	60	-	deg.	3)		
		θ_{x-}	-	60	-				
	Ver.	θ_{y+}	-	30	-				
		θ_{y-}	-	50	-				

Note 1) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L63 / L0$$

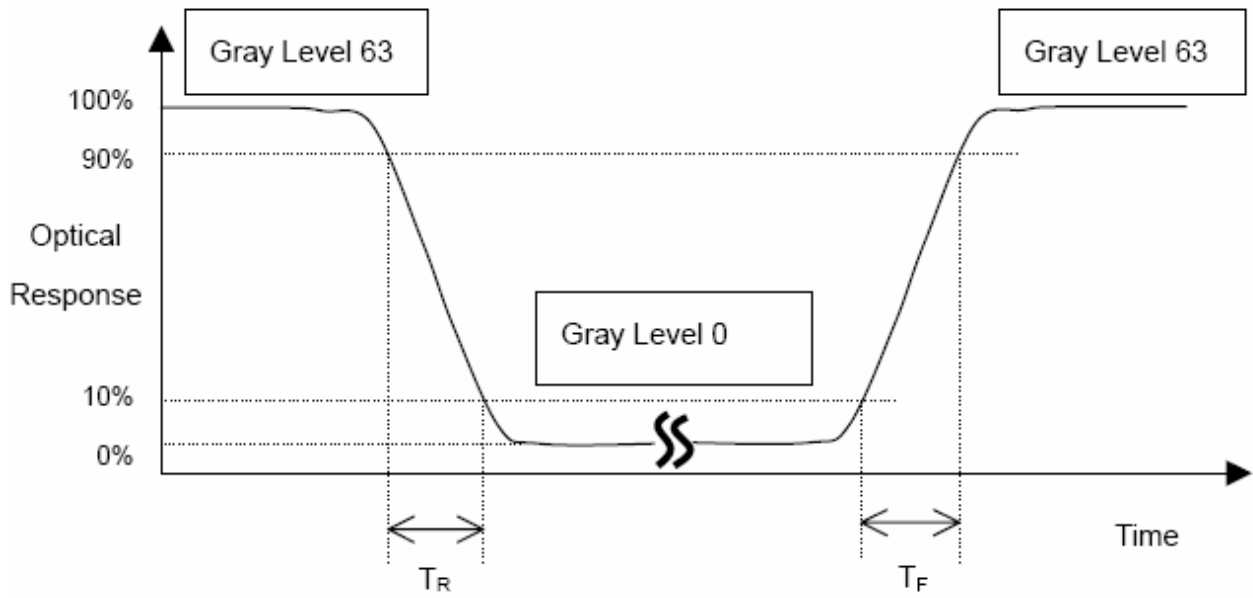
L63: Luminance of gray level 63(WHITE)

L0: Luminance of gray level 0(BLACK)

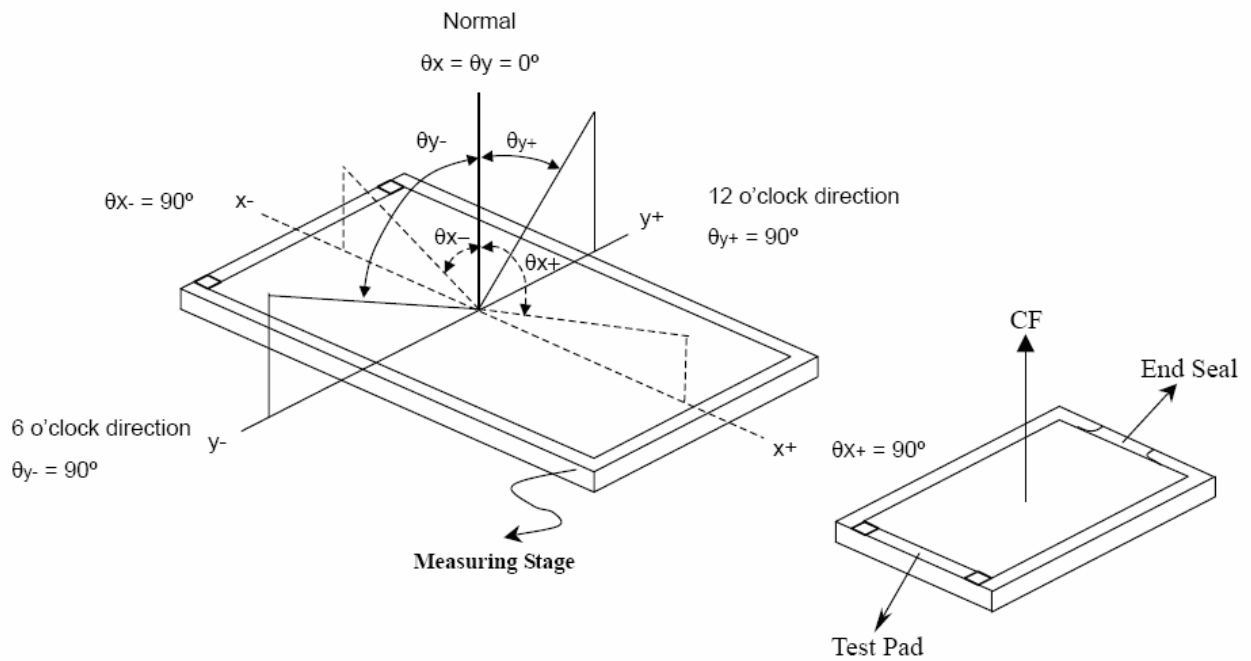
$$CR = CR(10)$$

CR (X) is corresponding to the Contrast Ratio of the point  at Figure in Note (5).

Note 2) Definition of Response Time (T_R , T_F):

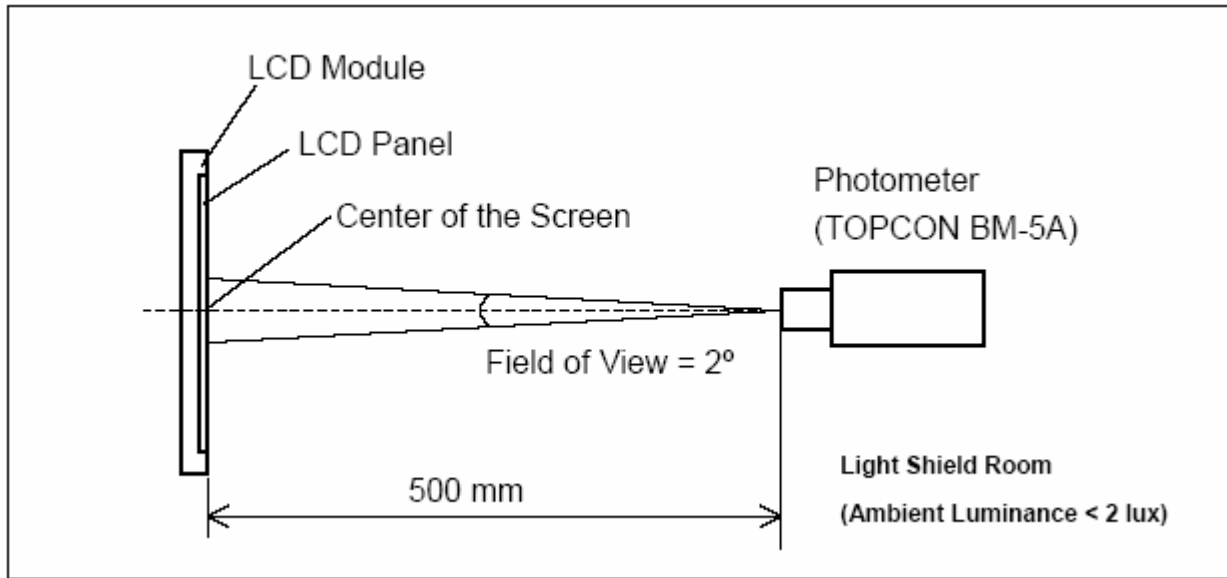
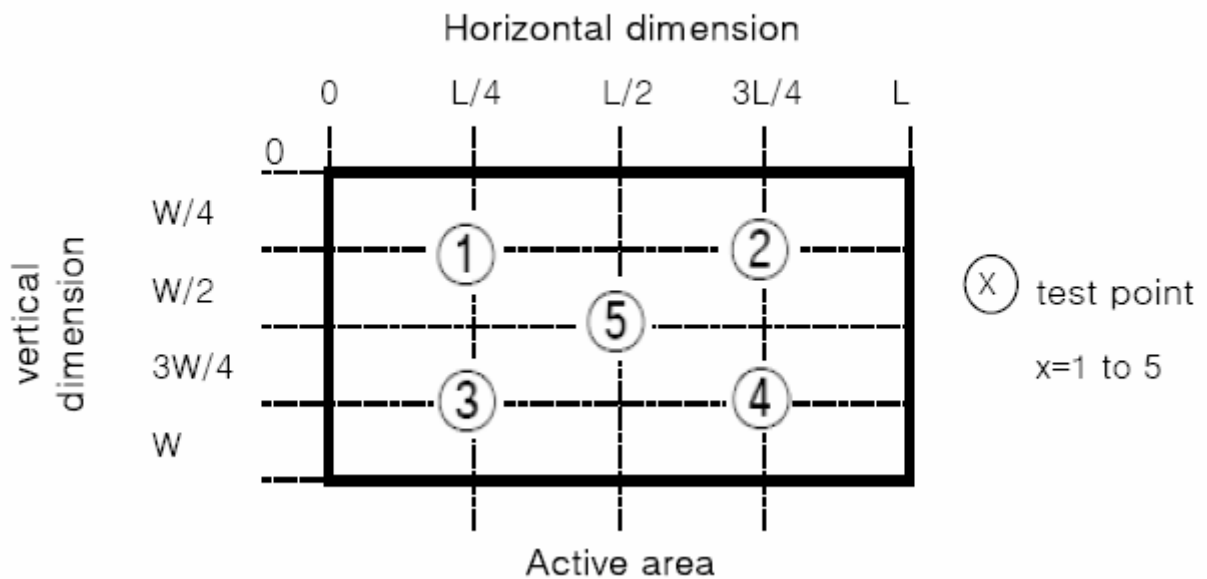


Note 3) Definition of Viewing angle

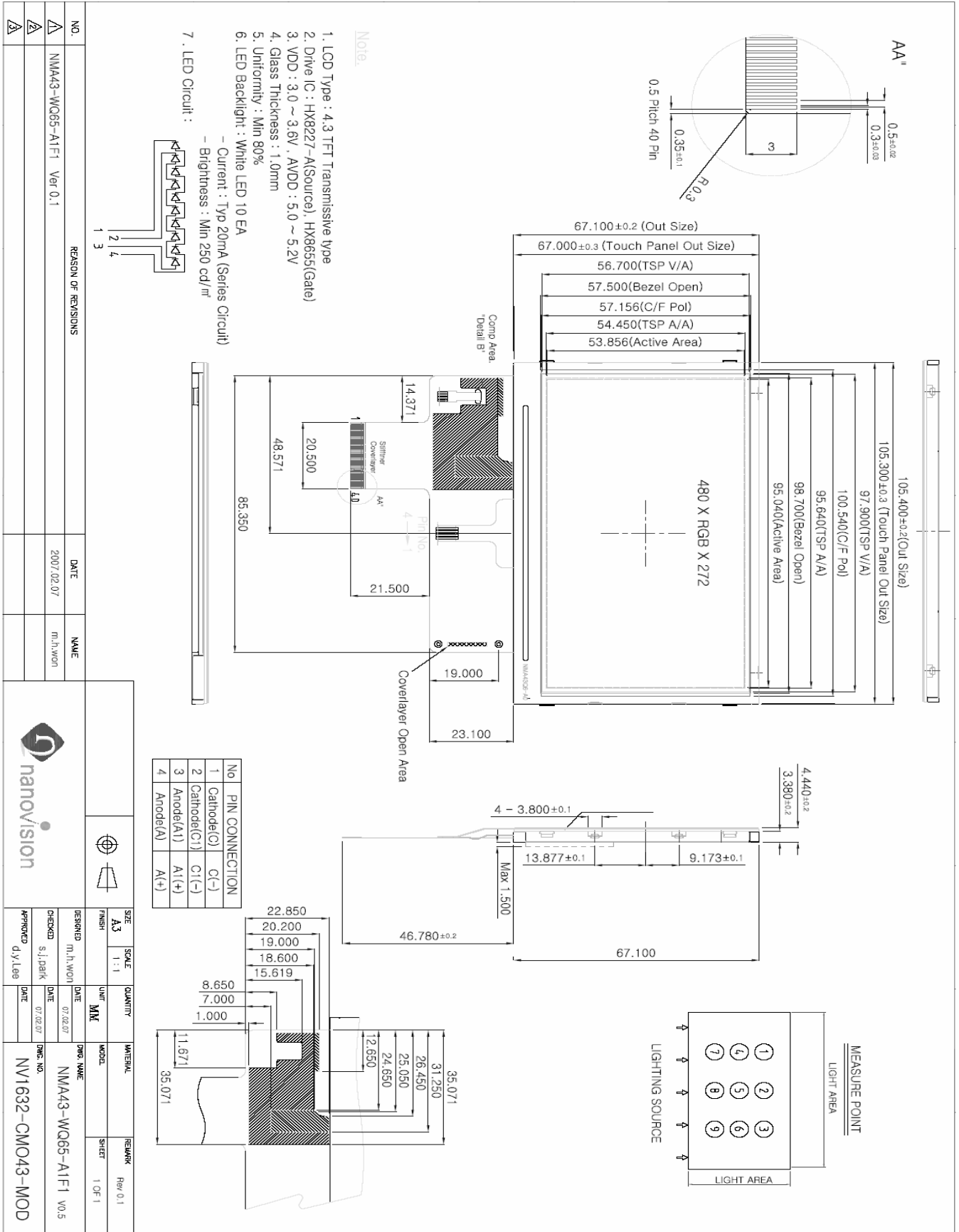


Note 4) Measurement Set-up:

The LCD module should be stabilized at a given temperature for 20 minutes to abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.


Note 5)


10. Outline Dimension

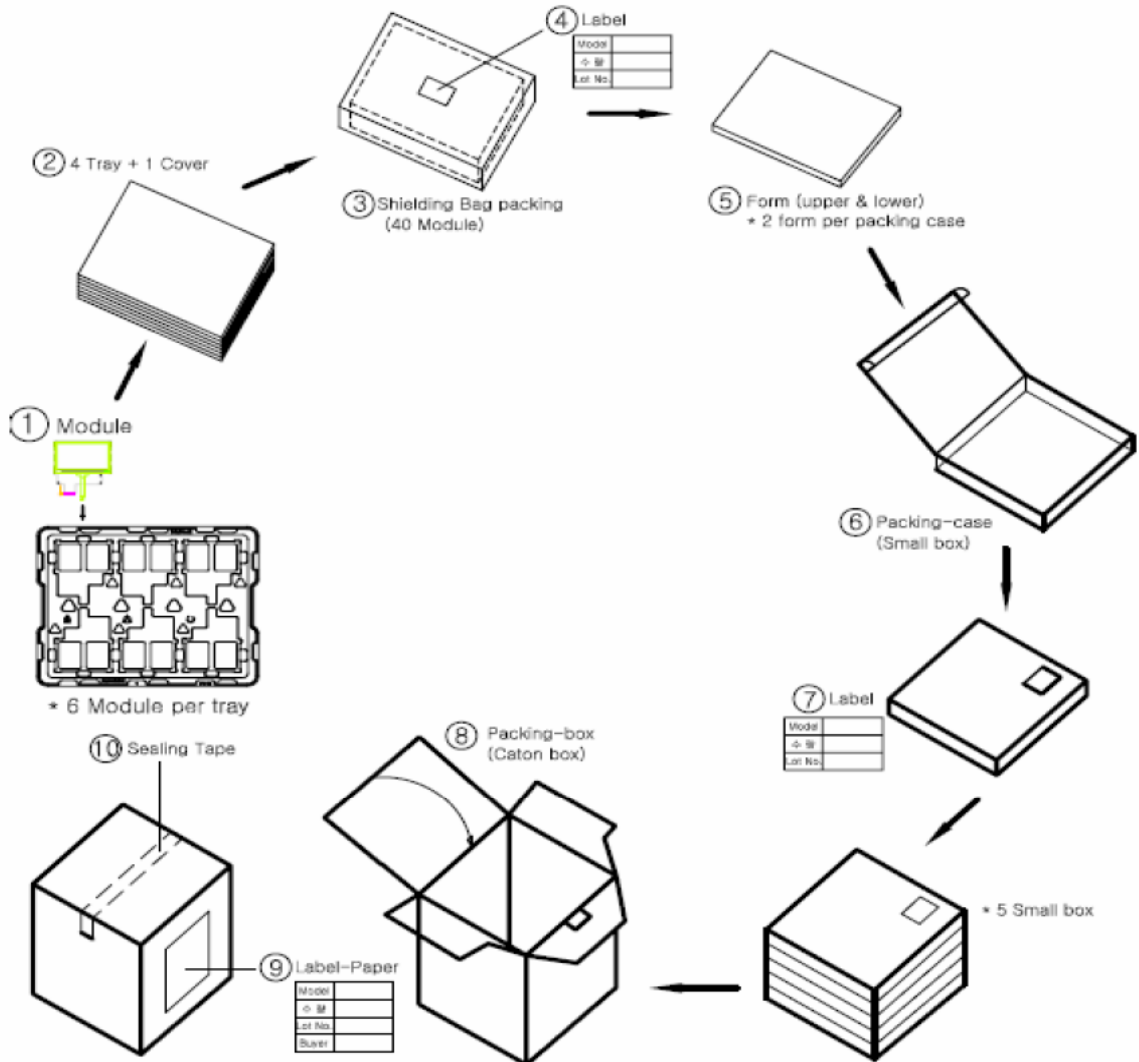


11. Reliability Test

Test Item	Test Condition	Remark
High Temperature Operation	70±2℃, 240 hours	
High Temperature Storage	80±2℃, 240 hours	
Low Temperature Operation	-20±2℃, 240 hours	
Low Temperature Storage	-30±2℃, 240hours	
High Temperature and High Humidity Operation	60℃, 90%(RH), 240 hours	
Thermal Shock Test	-30℃(0.5h)↔80℃(0.5h), 100cycle	
Vibration Test (Packaging State)	10~60Hz, 1.5mm amplitude, XYZ direction for 1 hour	

12. Packing Form

* Packing Form



No.	Q'TY	Parts	Size
1	6	Module	105.4±0.2 X 67.1±0.2 X 4.5(D)mm
2	5	Tray	421X342X14 mm
3	1	Shielding Bag	480X600 mm
4	2	Label-1	Art Paper 99.1X38.1 mm
5	2	Form	430X335X10 mm (Up. Down)
6	5	Inner Box	455X360X80 mm
7	1	Carton Box	470X375X445 mm
8	1	Label-2	Art Paper 200X140 mm
9	2m(L)	Tape	50mmX50mmX0.04mm
10	1	Final 1 Box (Inner box X 5) = 120 pcs	

13. Precautions

Operation Precautions

- (1) Do not connect, disconnect the module in the "Power On" condition.
- (2) Power supply should always be turned on/off by the chapter 8 TFT-LCD IC Operation Algorithms.

Storage Precautions

- (1) Storage them in a dark place. Do not expose to sunlight or fluorescent light.
Keep the temperature between 5°C and 35°C at normal humidity.
- (2) The TFT-LCD glass 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.

Handling Precautions

- (1) Be sure insert and take out of the FPC into the connector of the set after turning off the power supply on the set side.
- (2) On mounting the module, be sure to fix the module on the same place. Taking care
Care not to warp or twist the module.
- (3) The FPC for LCD panel shall be bent only slit portion. Don't give the FPCs too large force, for example, hanging the module with holding FPC.
- (4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining
And discoloration may occur.
- (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (6) 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.

- (7) 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 cloths, it must be washed away thoroughly with soap.
- (8) Protect the module from static, it may cause damage to the CMOS Gate Array IC.
- (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (10) Do not disassemble the module.
- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.

Others

- (1) The Liquid crystal is deteriorated by ultraviolet, do not leave it in direct sunlight and strong ultraviolet ray for many hours.
- (2) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
- (3) Do not exceed the absolute maximum rating value. (The supply voltage variation, Input voltage variation, variation in part contents and environmental temperature, etc)
Otherwise the panel may be damaged.
- (4) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image "Sticks" to the screen.
- (5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.