TITLE:

HV320WX2-506 Product Specification

BEIJING BOE DISPLAY TECHNOLOGY

REVISION HISTORY

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2013.08.05	Cuixiaopeng

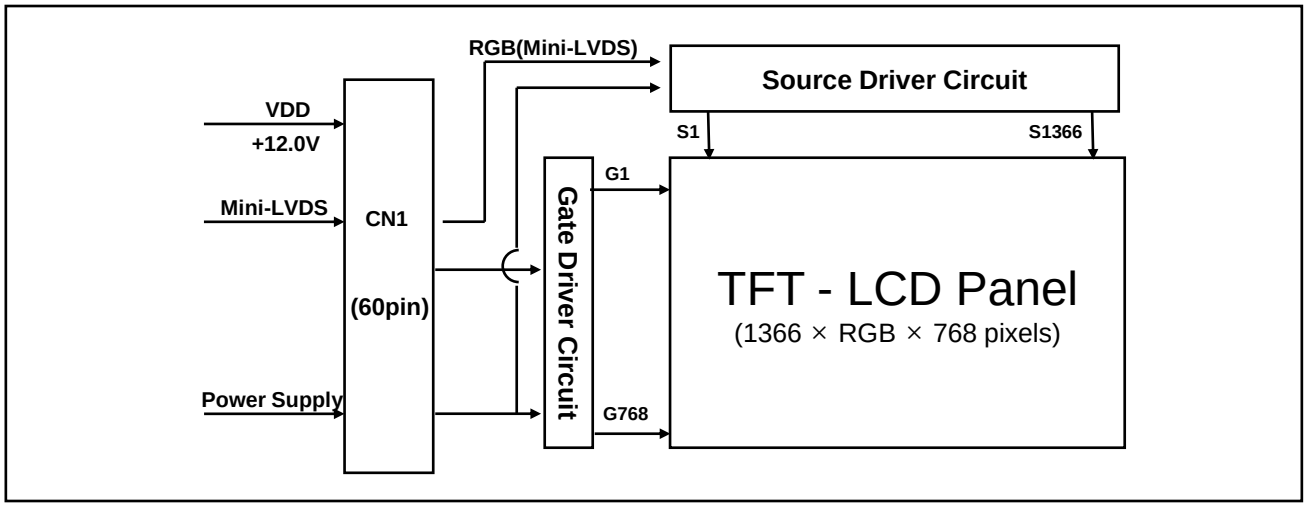
Contents

No	ITEM	Page
	REVISIONS HISTORY	2
	CONTENTS	3
1	GENERAL DESCRIPTION	4
	1.1 Introduction	
	1.2 Features	
	1.3 Applications	
	1.4 General Specification	
2	ABSOLUTE MAXIMUM RATINGS	6
3	ELECTRICAL SPECIFICATIONS	7
	3.1 TFT LCD Open Cell	
4	INTERFACE CONNECTION	8
	4.1 Open Cell Input Signal & Power	
5	SIGNAL TIMING SPECIFICATIONS	10
	5.1 Timing Parameters(DE Only Model)	
	5.2 Signal Timing Waveform	
	5.3 Power Sequence	
6	OPTICAL SPECIFICATIONS	14
7	MECHANICAL CHARACTERISTICS	16
8	RELIABILITY TEST CONDITION	17
9	PRODUCT SERIAL NUMBER	18
10	PACKING INFORMATION	19
11	HANDING & CAUTIONS	21
12	APPENDIX	22

1.0 GENERAL DESCRIPTION

1.1 Introduction

HV320WX2-506 is a color active matrix TFT LCD open cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This open cell has a 31.51 inch diagonally measured active area with WXGA resolutions (1366 horizontal by 768 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this open cell can display 16.7M colors. The TFT-LCD panel used for this open cell is adapted for a low reflection and higher color type.



1.2 Features

- High-speed response
- Low color shift image quality
- 8-bit color depth, display 16.7M colors
- High luminance and contrast ratio, low reflection and wide viewing angle
- AFFS technology is applied for high display quality
- RoHS compliant

1.3 Application

- Home Alone Multimedia TFT-LCD TV
- Display Terminals for Control System
- High Definition TV(HD TV)
- AV application Products

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remark
Glass thickness	0.5	mm	0.5t Glass
Active area	697.685(H) × 392.256(V)	mm	
Number of pixels	1366(H) ×768(V)	pixels	
Pixel pitch	170.25(H) ×RGB×510.75(V)	㎛	
Pixel arrangement	Pixels RGB Vertical stripe		
Display colors	16.7M(8bits-true)	colors	
Display mode	Transmission mode, Normally Black		
Open Cell Transmittance	6.5 (typ.)	%	At center point with BOE BLU
Weight	895 (typ.)	gram	
Surface Treatment	Haze 10%, 3H, Semi-glare or Anti-glare treatment (Front Polarizer) Clear (Bottom Polarizer)		

2.0 ABSOLUTE MAXIMUM RATINGS

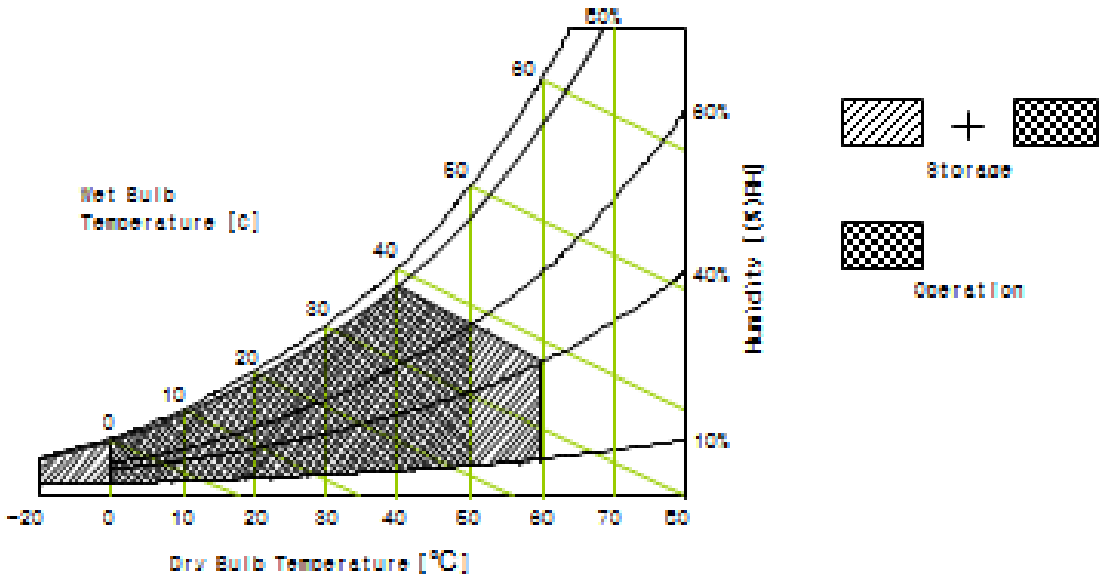
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Open Cell Electrical Specifications >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	To reference 3.0 ELECTRICAL SPECIFICATIONS			
Operating Temperature	T_{OP}	0	+50	℃	Note 1
	T_{SUR}	0	+60	℃	
Storage Temperature	T_{ST}	-20	+60	℃	
Operating Ambient Humidity	Hop	10	80	%RH	
Storage Humidity	Hst	10	80	%RH	

Note 1 : Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



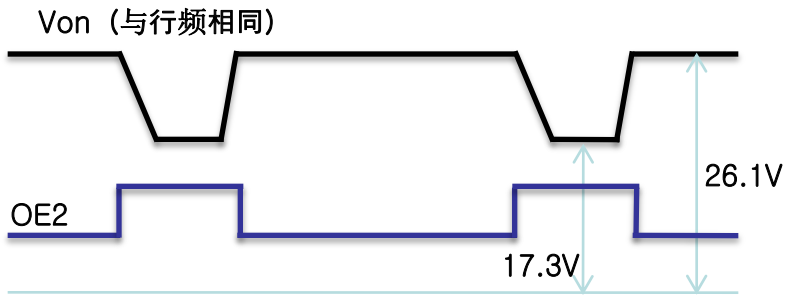
3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Open Cell

< Table 3. Open Cell Electrical Specifications >

[Ta =25±2 ℃]

Characteristics	Symbol	Min	Typ	Max	Unit
DC Supply Voltage	VDDD	3.0	3.3	3.6	V
DC Supply Voltage	Voff	-8.5	-8	-7.5	V
DC Supply Voltage	Von		24		V
DC Supply Voltage	VREF	15.7	16	16.3	V
DC Supply Voltage	VCOM	7.2	7.5	7.8	V
DC Supply Voltage	VMID	7.7	7.9	8.1	V
DC Supply Voltage	AVDD	16	16.3	16.6	V



Characteristics	Symbol	Min	Typ	Max	Unit
DC Supply Voltage	DVDD		50	100	mA
DC Supply Voltage	Voff		10	100	mA
DC Supply Voltage	Von		20	100	mA
DC Supply Voltage	VREF		30	100	μA
DC Supply Voltage	VCOM		50	200	mA
DC Supply Voltage	VMID		50	100	mA
DC Supply Voltage	AVDD		250	350	mA

Note: Vcom short-circuit current 400mA

Max Noise

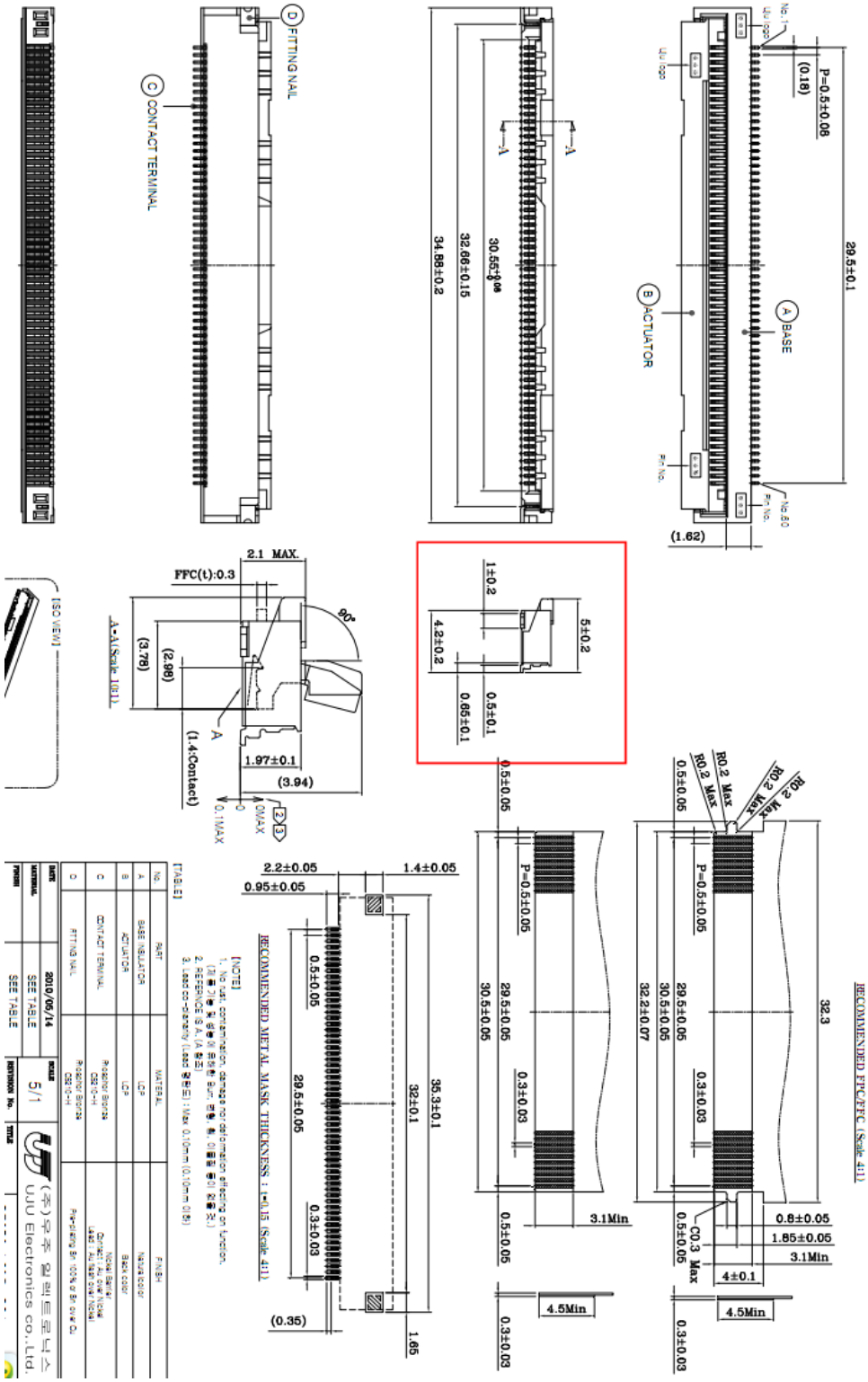
Characteristics	Symbol	Max	Unit
DC Supply Voltage	DVDD	10	mV
DC Supply Voltage	Voff	25	mV
DC Supply Voltage	Von	100	mV
DC Supply Voltage	VREF	30	mV
DC Supply Voltage	VCOM	10	mV
DC Supply Voltage	VMID	100	mV
DC Supply Voltage	AVDD	30	mV

4.0 INTERFACE CONNECTION

4.1 Open Cell Input Signal & Power

4.1.1 Connector

NO.	BOE PINMAP	Description
1	CPV	Gate driver clock input
2	NC	NC
3	STV	Gate driver vertical start pulse
4	OE1	Gate driver output enable signal
5	XAO	When XAO_L/R goes low, all outputs are fixed to VGG。 XAO_L/R signal has priority over OE_L/R
6	NC	NC
7	GND	GND
8，9	DVDD	Power supply for digital circuit.
10	GND	GND
11	VOFF	Negative power supply for gate
12	GND	GND
13，14	VON	Positive power supply for gate
15	GREF	Power supply for GAMMA reference
16,17	VCOM	common electrode for LCD
18	NC	NC
19	TP	Source driver latch signal
20	POL	Source driver polarity inversion signal
21	PAIRMODE	Selects mini-LVDS input mode： H:6-Pair Mode. (default)　　L:3-Pair Mode.
22	VMID	Power supply for analog circuit VMID=1/2AVDD
23	VMID	Power supply for analog circuit VMID=1/2AVDD
24~26	AVDD	Power supply for analog circuit
27	GND	GND
28~41	NC	NC
42	GND	GND
43	GND	GND
44	mLV5N	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
45	mLV5P	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
46	mLV4N	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
47	mLV4P	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
48	mLV3N	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
49	mLV3P	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
50	GND	GND
51	mLVCLKN	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
52	mLVCLKP	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
53	GND	GND
54	mLV2N	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
55	mLV2P	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
56	mLV1N	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
57	mLV1P	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
58	mLV0N	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
59	mLV0P	Differential inputs (mini-LVDS) for 8-bit RGB data and control signal
60	GND	GND


D FITTING NAIL
C CONTACT TERMINAL
B ACTUATOR
A BASE
P=0.5±0.08
(0.18)
29.5±0.1
(1.62)
34.88±0.2
32.66±0.15
30.55±0.08
2.1 MAX.
FFC(t):0.3
90°
(3.78)
(2.96)
(1.4:Contact)
1.97±0.1
(3.94)
0MAX
0.1MAX
5±0.2
4.2±0.2
1±0.2
0.5±0.1
0.65±0.1
0.5±0.05
P=0.5±0.05
29.5±0.05
30.5±0.05
0.3±0.03
3.1Min
4.5Min
RECOMMENDED METAL MASK THICKNESS : t=0.15 (Scale 4/1)
2.2±0.05
1.4±0.05
0.95±0.05
0.5±0.05
29.5±0.05
32±0.1
35.3±0.1
0.3±0.03
(0.35)
1.65
RECOMMENDED FFC/FFC (Scale 4/1)
R0.2 Max
0.5±0.05
32.2±0.07
32.3
C0.3 Max
0.8±0.05
1.85±0.05
3.1Min
4±0.1
4.5Min
[TABLE]
SEE TABLE
2010/06/14
5/1
UJU Electronics co.,Ltd.
(주)우주일렉트로닉스

5.0 SIGNAL TIMING SPECIFICATION

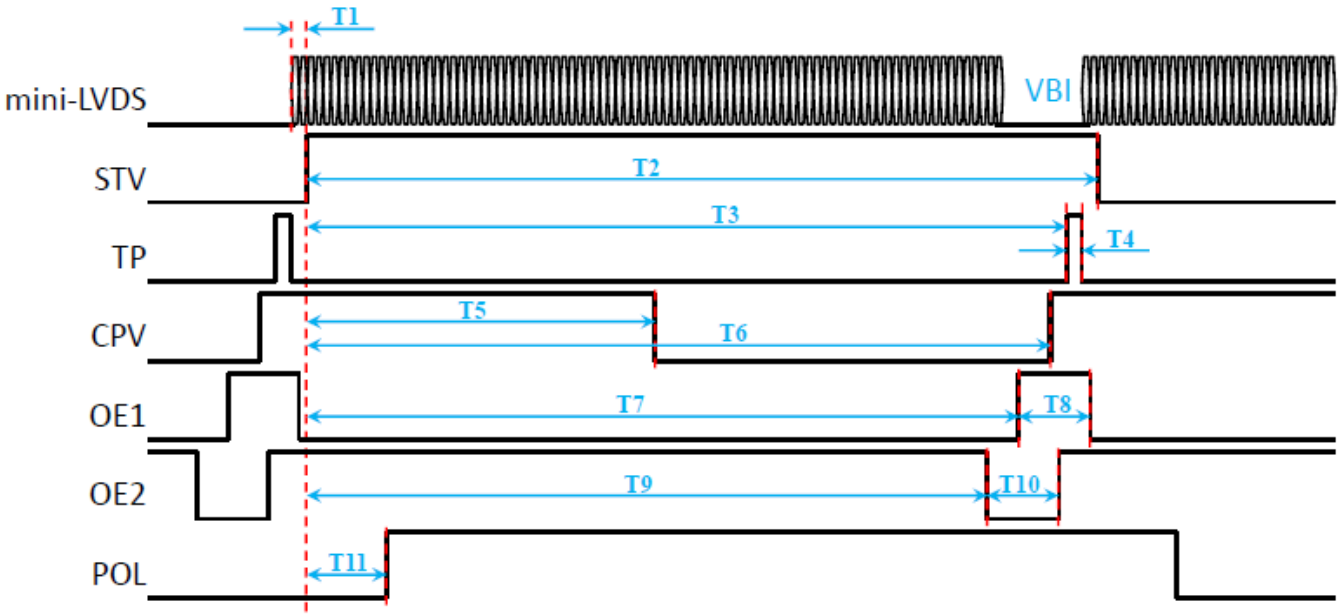
5.1 Timing Parameters (DE only mode)

< Table 7. Timing Table >

ITEM	Symbol		Min	Typ	Max	Unit	Note
CLK	Period	t_{CLK}	11.8	13.3	17.9	ns	
	Frequency	-	56	75.4	85.0	MHz	
Hsync	Period	t_{HP}	1450	1560	2000	t_{CLK}	
	Frequency	f_H	39.4	48.4	55	KHz	
Vsync	Period	t_{VP}	778	806	1200	t_{HP}	
	Frequency	f_V	47	60	65	Hz	
Horizontal Active Display Term	Valid	t_{HV}	-	1366	-	t_{CLK}	
	Total	t_{HP}	1450	1560	2000	t_{CLK}	
Vertical Active Display Term	Valid	t_{VV}	-	768	-	t_{HP}	
	Total	t_{VP}	778	806	1200	t_{HP}	

Notes: This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

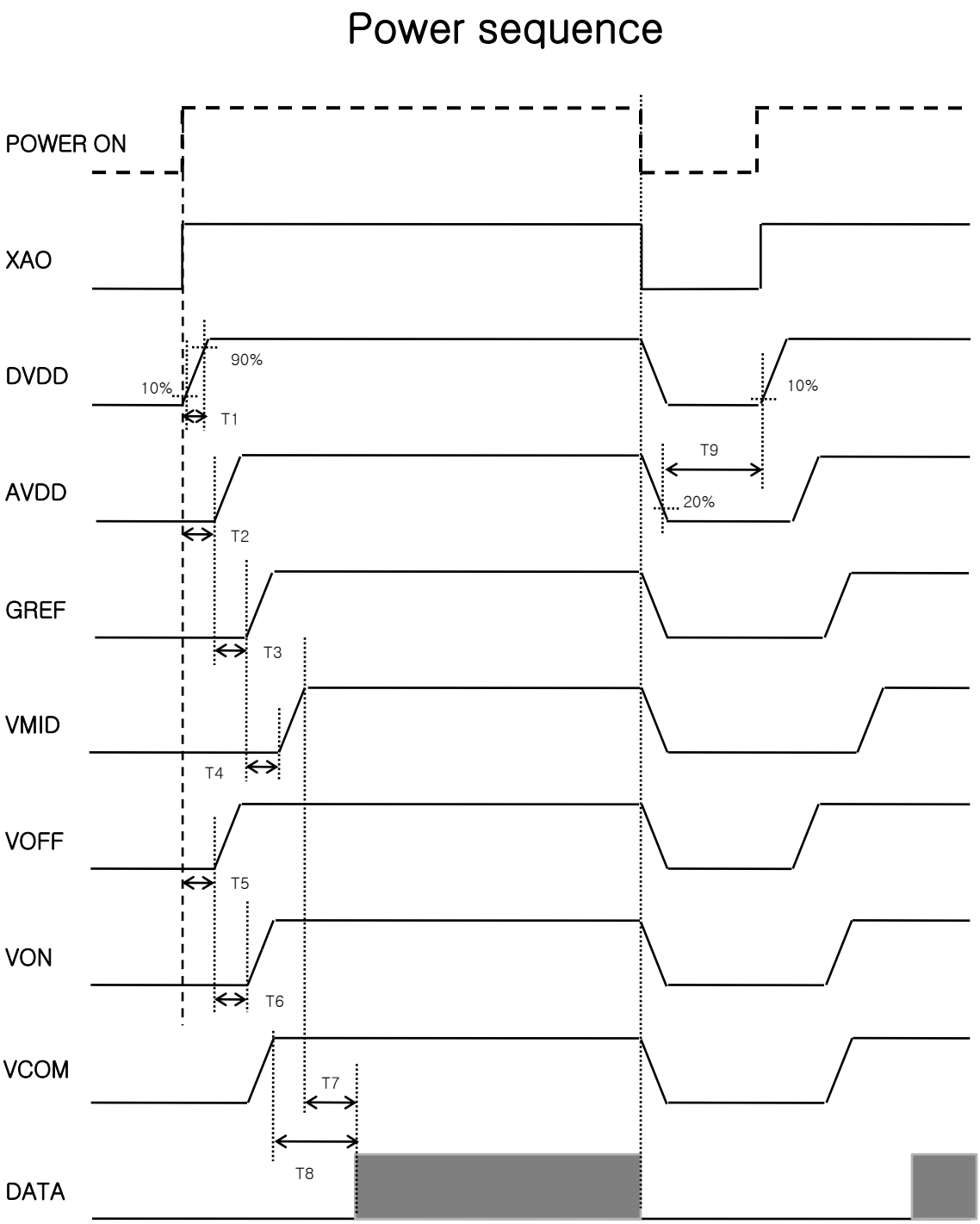
5.2 Signal Timing Waveform



T1=91$T_{mini\text{-}CLK}$	**0.65μs**	**T7=2207$T_{mini\text{-}CLK}$**	**15.76μs**
T2=2941$T_{mini\text{-}CLK}$	**21μs**	**T8=714$T_{mini\text{-}CLK}$**	**5.1μs**
T3=2647$T_{mini\text{-}CLK}$	**18.9μs**	**T9=1926$T_{mini\text{-}CLK}$**	**13.75μs**
T4=140$T_{mini\text{-}CLK}$	**1μs**	**T10=714$_{mini\text{-}CLK}$**	**5.1μs**
T5=936$T_{mini\text{-}CLK}$	**6.68μs**	**T11=345$T_{mini\text{-}CLK}$**	**2.46μs**
T6=2545$T_{mini\text{-}CLK}$	**18.17μs**		

$F_{mini\text{-}CLK}$=140MHz
$T_{mini\text{-}CLK}$=7.14ns

5.3 Power Sequence



T	Min	Type	Max	Unit	Note
T1	0		10	ms	
T2	0			ms	
T3	0			ms	AVDD must be higher than VMID and GREF all the time
T4	0			ms	AVDD must be higher than VMID and GREF all the time
T5	0			ms	
T6	0			ms	
T7	0			ms	
T8	0			ms	
T9	0			ms	

6.0 OPTICAL SPECIFICATIONS

The test of optical specifications shall be measured in a dark room (ambient luminance≤1 lux and temperature=25±2℃) with the equipment of Luminance meter system (Goniometer system and PR730) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to $\theta_{Ø=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= θ_9) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$(= θ_6) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 12.0V +/-10% at 25°C. Optimum viewing angle direction is 6 'clock.

< Table 10. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta =25±2 ℃]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10		89		Deg.	Note 1
		Θ_9			89		Deg.	
	Vertical	Θ_{12}			89		Deg.	
		Θ_6			89		Deg.	
Contrast ratio		CR	Θ = 0° (Center) Normal Viewing Angle With BOE Module	900:1	1200:1	-		Note 2
Reproduction of color	White	W_x		TYP. - 0.03	0.280	TYP. + 0.03		Note 3
		W_y			0.290			
	Red	R_x			-			
		R_y			-			
	Green	G_x			-			
		G_y			-			
	Blue	B_x			-			
		B_y			-			
Response Time	G to G	T_g		-	8	10	ms	Note 4
Gamma Scale				2.0	2.2	2.4		
Luminance of Black		Y_b		-	-	0.5	cd/m^2	Note 6
Cell Transmittance					6.5		%	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of $\theta = 0°$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See Figure 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. The color chromaticity coordinates specified in Table 9.shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
4. Response time Tg is the average time required for display transition by switching the input signal as below table and is based on Frame rate fV =60Hz to optimize.
   Each time in below table is defined as Figure 2and shall be measured by switching the input signal for "any level of gray(bright)"and "any level of gray(dark)".

Measured Response Time		Target																
		0	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255
Start	0																	
	15																	
	31																	
	47																	
	63																	
	79																	
	95																	
	111																	
	127																	
	143																	
	159																	
	175																	
	191																	
	207																	
	223																	
	239																	
	255																	

5. Definition of Transmittance (T%) :
   Module is with white(L255) signal input

$$\text{Transmittance} = \frac{\text{Luminance of LCD Module}}{\text{Luminance of BLU}} \times 100\ \%$$

6. There will be less than 3 times of black luminance difference between center and each 4 corners. The position of 4 corners are described in Appendix Figure.4

7.0 MECHANICAL CHARACTERISTICS

7.1 Dimensional Requirements

Figure 3 (located in Appendix) shows mechanical outlines for the model HV320WX2-261. Other parameters are shown in Table 10.

< Table 11. Dimensional Parameters >

Parameter	Specification	Unit
Glass thickness	0.5	mm
Active area	697.685 (H) ×392.256(V)	mm
Pixel pitch	0.51(H) ×0.51(V)	mm
Number of pixels	1366(H) ×768(V) (1 pixel = R + G + B dots)	pixels
Weight	895 (typ.)	gram

7.2 Semi-Glare and Polarizer Hardness

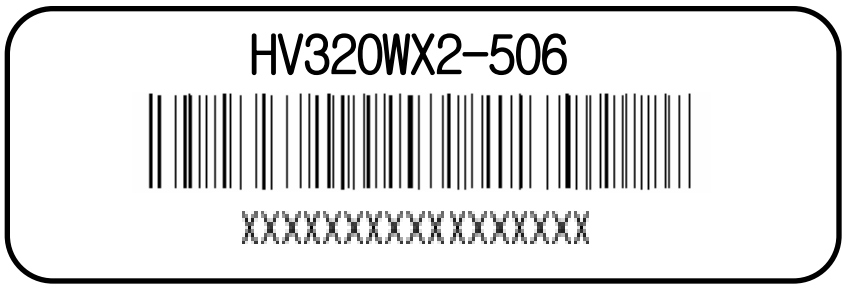
The surface of the LCD has an semi-glare coating to minimize reflection and a coating to reduce scratching.

8.0 Reliability Test Condition

< Table 12. Reliability Test Condition >

Item	Test Condition
High Temperature Storage Test	Ta = 60 ℃, 240 hrs
Low Temperature Storage Test	Ta = -20 ℃, 240 hrs
High Temperature & High Humidity Operation Test	Ta = 50 ℃, 80%RH, 240hrs
High Temperature Operation Test	Ta = 50 ℃, 240hrs
Low Temperature Operation Test	Ta = 0 ℃, 240hrs

9.0 PRODUCT SERIAL NUMBER



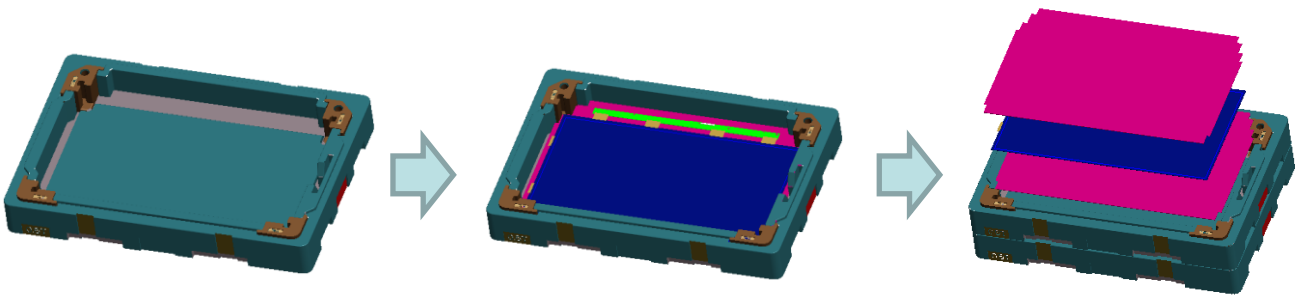
1	2	3	4	5	6	7
X X	X	X	X X	X	X X X X	X X X X X X

1. Control Number
2. Rank / Grade
3. Line Classification
4. Year (2011 : 11, 2012 : 12, …)
5. Month (1,2,3, … , 9, X, Y, Z)
6. Internal Use
7. Serial Number

10.0 PACKING INFORMATION

BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below. The packing material ESD Spec is shown in Appendix Figure 7.

10.1 Packing Order

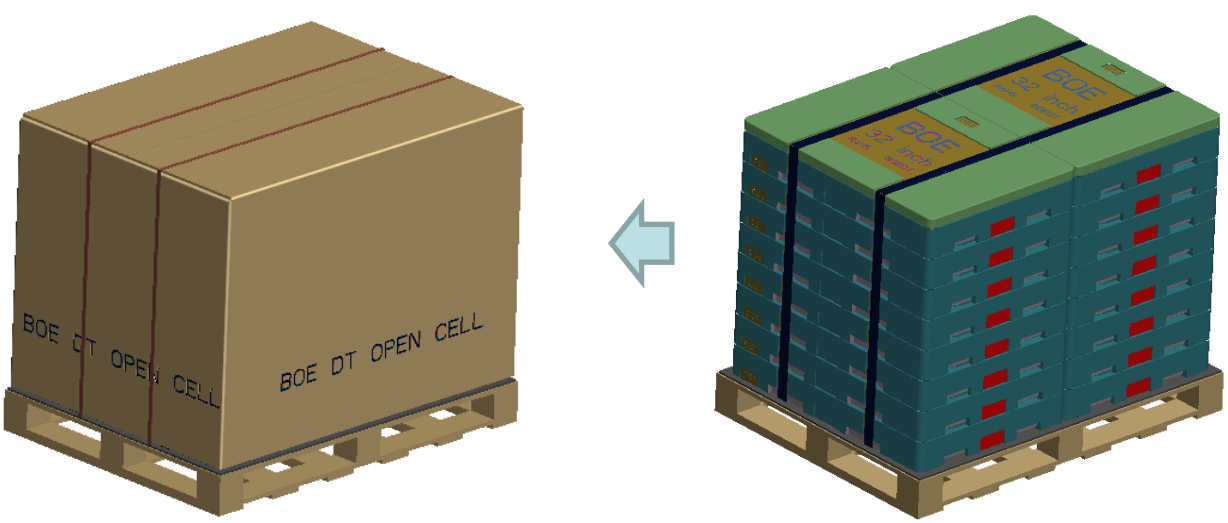


Dense box

15pcs Open Cell / Dense box

up

down



240pcs Open Cell / Pallet

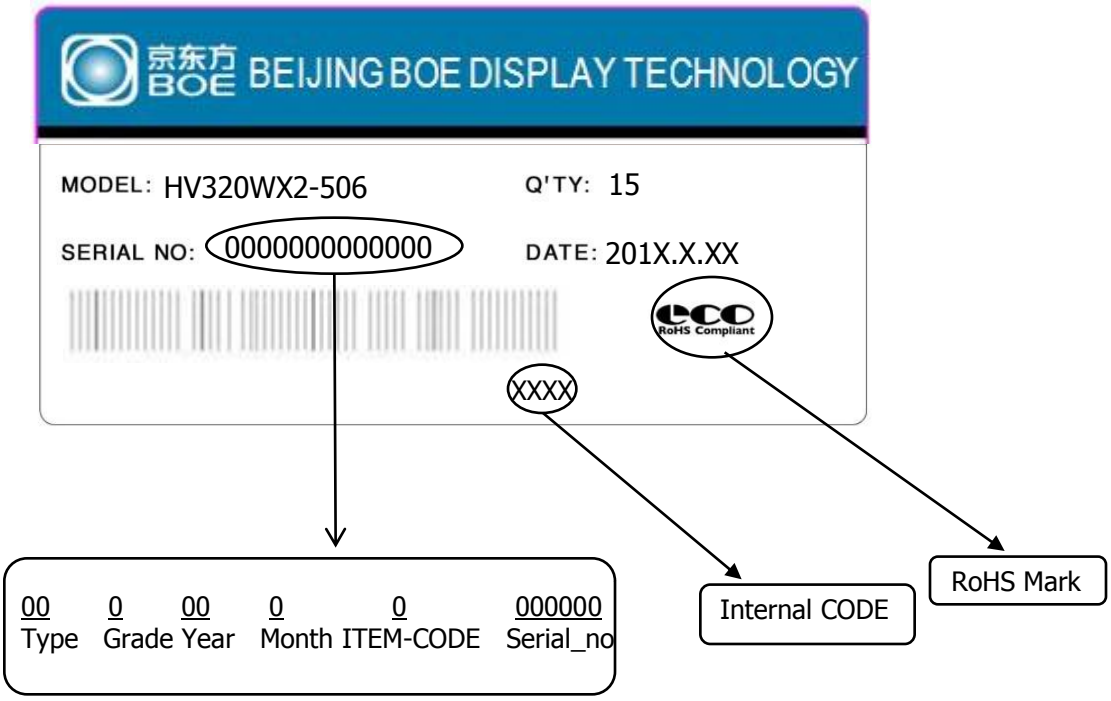
10.2 Packing Note

- Box Dimension : 880mmL×605mmW×140mmH
- Package Quantity in one Box : 15pcs

10.3 Box Label

- Label Size : 110 mm (L) × 55 mm (W)
- Contents

  Model : HV320WX2-506
  Q`ty : 15 Open Cell in one box.
  Serial No. : Box Serial No. See next page for detail description.
  Date : Packing Date
  FG Code : FG Code of Product



11.0 HANDLING & CAUTIONS

CAUTIONS

(1) Cautions when taking out the Panel

Pick the pouch only, when taking out panel from a shipping package.

(2) Cautions for handling the panel

As the electrostatic discharges may break the LCD Panel, handle the LCD panel with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.

As the LCD panel and back -light element are made from fragile glass material, impulse and pressure to the LCD panel should be avoided.

As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.

Do not pull the interface connector in or out while the LCD panel is operating.

Put the panel display side down on a flat horizontal plane.

Handle connectors and cables with care.

(3) Cautions for the operation

When the panel is operating, do not lose CLK, ENAB signals. If any one of these signals Is lost, the LCD panel would be damaged.

Obey the supply voltage sequence. If wrong sequence is applied, the panel would be damaged.

(4) Cautions for the atmosphere

Dew drop atmosphere should be avoided.

Do not store and/or operate the LCD panel in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the panel characteristics

Do not apply fixed pattern data signal to the LCD panel at product aging.

Applying fixed pattern for a long time may cause image sticking.

(6) Other cautions

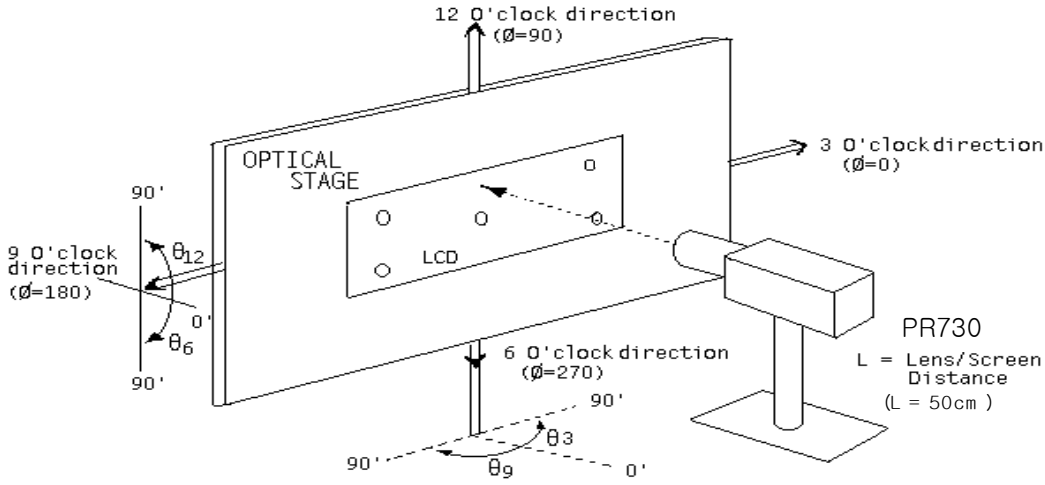
Do not disassemble and/or re-assemble LCD panel.

Do not re-adjust variable resistor or switch etc.

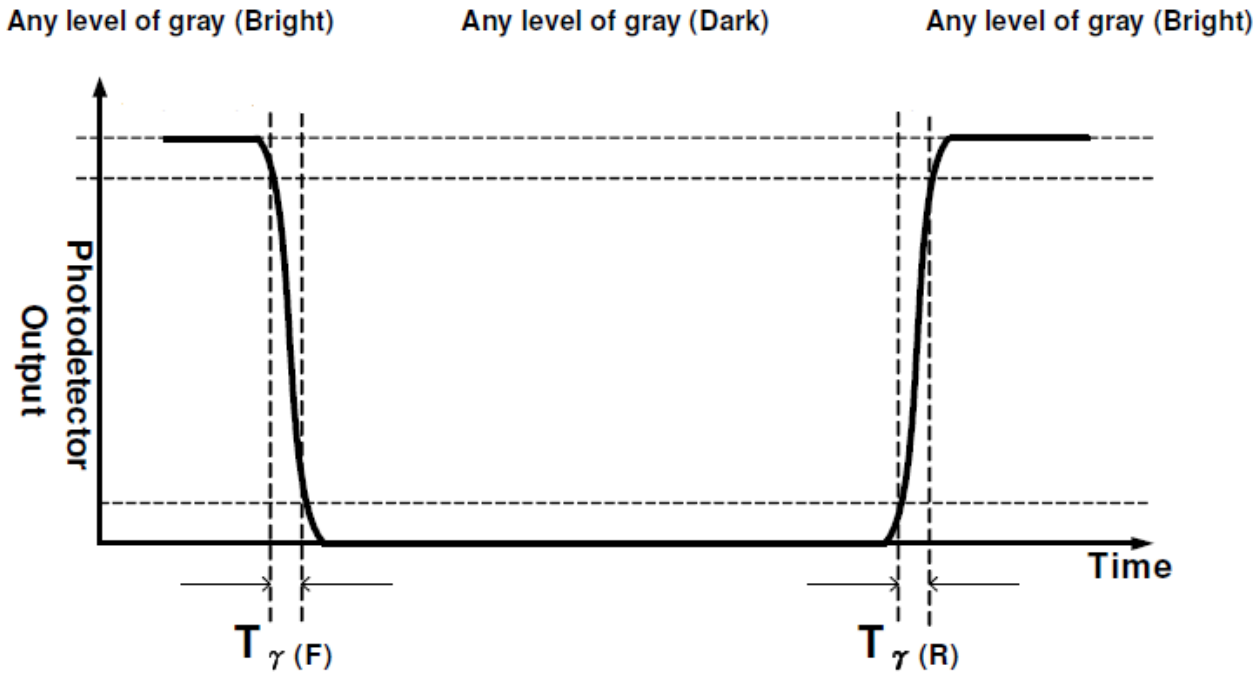
When returning the panel for repair or etc., Please pack the panel not to be broken. We recommend to use the original shipping packages.

12.0 APPENDIX

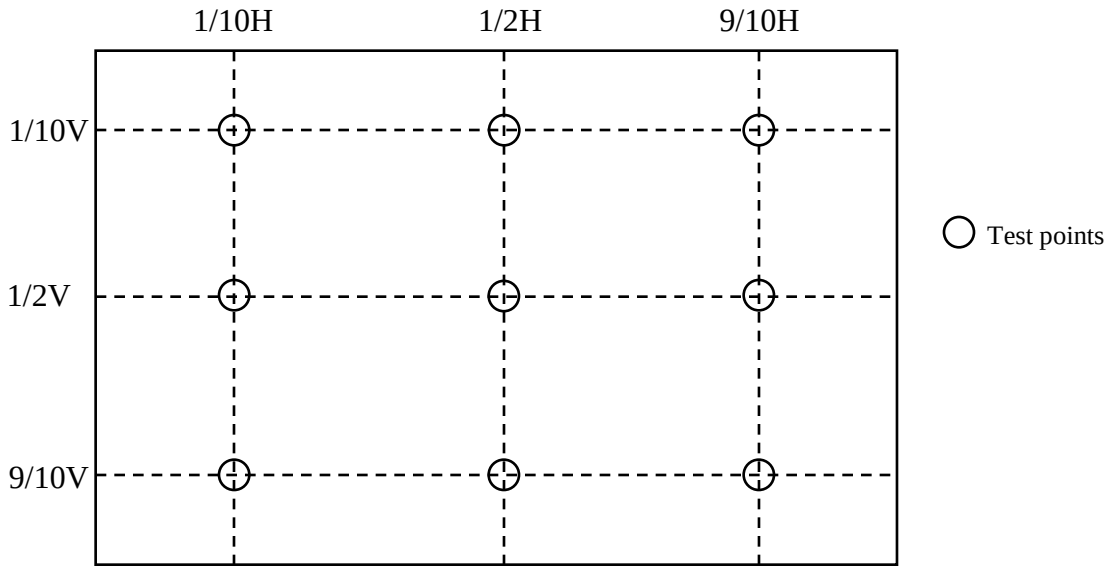
< Figure 1. Measurement Set Up >



< Figure 2. Response Time Testing >



< Figure 4. Optical Measurement Locations >



Active Area: 697.7 ×392.3mm

< Figure 3. Open Cell Outline Dimensions (Front View) >