TITLE : BA070WS1-400

Preliminary Product Specification

Rev. P0

HEFEI BOE OPTOELECTRONICS TECHNOLOGY

REVISION HISTORY

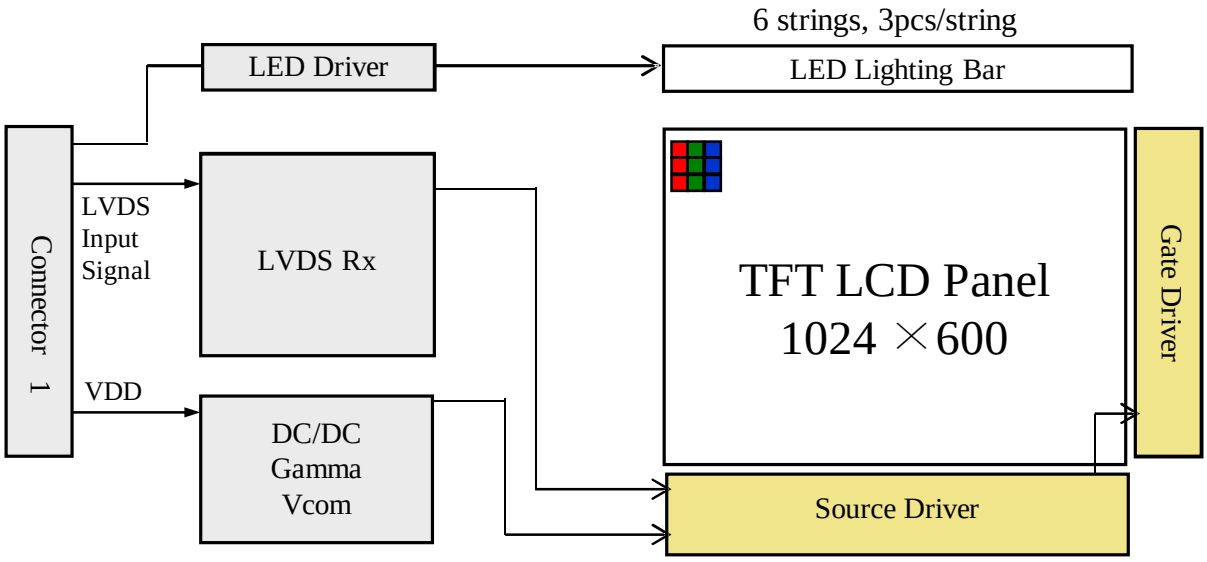
REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
PO		Initial Release	2013.10.22	曹云发

Content

1.0 GENERAL DESCRIPTION

1.1 Introduction

BA070WS1-100 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 7.0inch diagonally measured active area with WXGA resolutions (1024 horizontal by 600 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



1.2 Features

- 1 Channel LVDS Interface with 1 pixel / clock
- Thin and light weight
- Data enable signal mode
- 6-bit Hi-FRC color depth, display 16.7M colors
- Low driving voltage and low power consumption
- RoHS Compliant

1.3 Application

- AV application Products

1.4 General Specification

The followings are general specifications at the model BA070WS1-100. (listed in Table 1.)

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	153.6(W) x 90.0(H)	mm	
Number of pixels	1024(H) ×600(V)	pixels	
Pixel pitch	50(H) ×RGB×150(V)	㎛	
Pixel arrangement	Pixels RGB stripe arrangement		
Display colors	16.7M(6bits + Hi FRC)	colors	
Display mode	Transmission mode, Normally White		
Outline Dimension	167.25(H) × 104.65(V) × 2.8(body) (typ.)	mm	
Weight	110 (max.)	gram	
Power Consumption	P_D : 0.4(max.)	Watt	
	P_{BL} : 1.2(max.)		
	P_{Total} : 1.6(max.)		
Surface Treatment	HC + Clear (Front Polarizer) AG25 (Rear Polarizer)		

2.0 ABSOLUTE MAXIMUM RATINGS

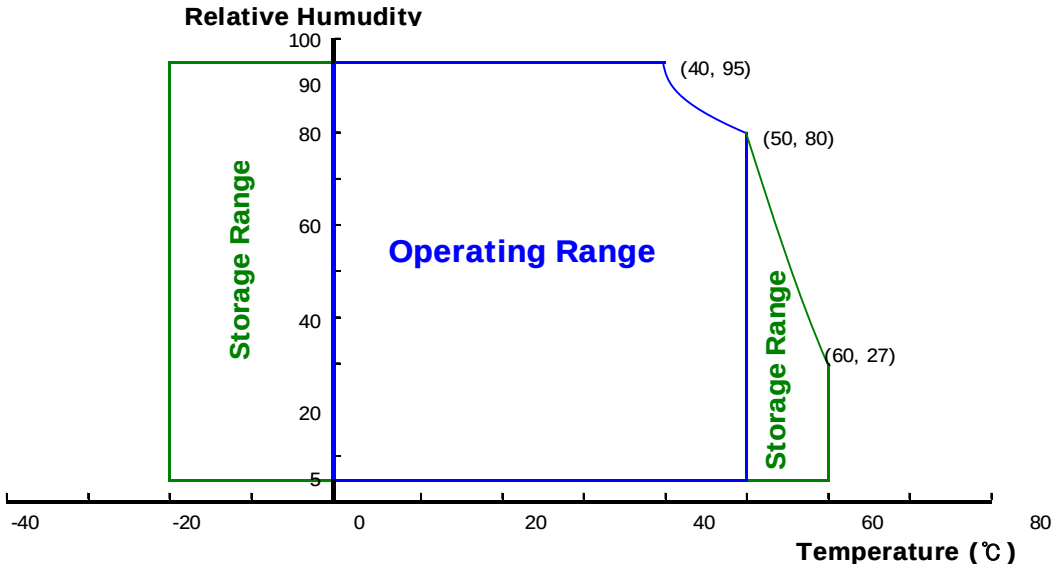
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. LCD Module Electrical Specifications > [VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-0.5	3.96	V	Note 1
Power Supply For LED	V_{LED}			V	
Operating Temperature	T_{OP}			℃	Note 2
Storage Temperature	T_{ST}			℃	

Notes : 1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

2. Temperature and relative humidity range are shown in the figure below.
95 % RH Max. (40 ^{O}C ≥ Ta)
Maximum wet - bulb temperature at 39 ^{O}C or less. (Ta > 40 ^{O}C) No condensation.

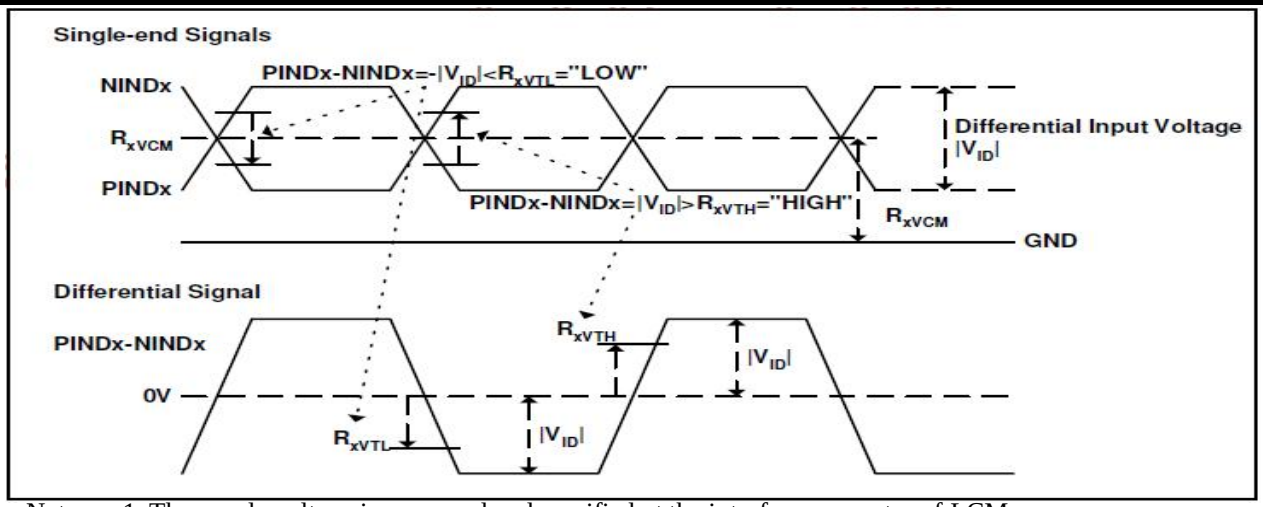


3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. LCD Module Electrical Specifications > [Ta =25±2 ℃]

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Power Supply Input Voltage		VDD	3	3.3	3.6	Vdc	
Power Supply Ripple Voltage		VRP			300	mV	
Power Supply Current		IDD	-	120	150	mA	1
Power Consumption		PDD		**0.4**	**0.5**	Watt	
Rush current		IRUSH	-	-	1	A	2
LVDS Interface	Differential Input High Threshold Voltage	VLVTH	100		300	mV	
	Differential Input Low Threshold Voltage	VLVTL	-300		-100	mV	
	Common Input Voltage	VLVC	|Vid|/2	1.2	VDD-1.2	V	
	Differential input voltage	|Vid|	0.2	-	0.6		
CMOS Interface	Input High Threshold Voltage	VIH	2.6	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.8	V	



Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=3.3V, Frame rate f_V=60Hz and Clock frequency = 51.24MHz. Test Pattern of power supply current is R/G/B.
2. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

3.2 LED Driver

- With LED Driver on Customer System , We only have two Pads on FPC .

3.3 Backlight unit

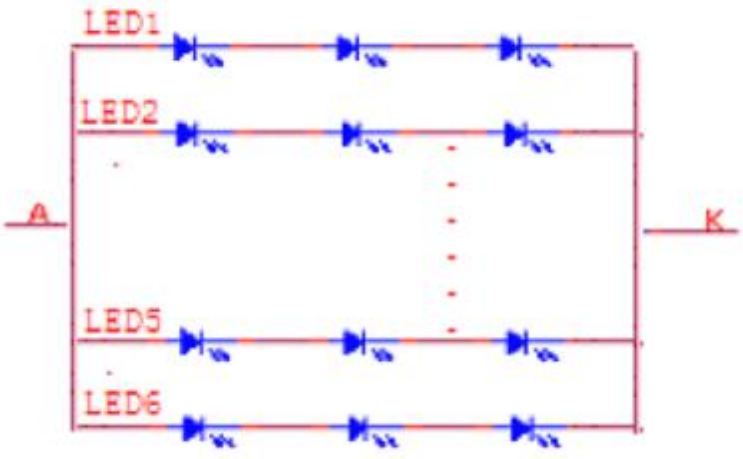
< Table 4. Backlight Unit Specifications > [Ta =25±2 ℃]

Items	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F		120	-	mA	18LEDs (3LED Serial, 6LED Parallel)
Forward Voltage	V_F			9.9	V	
Backlight Power Consumption	-		-	1.2	W	
Operating Life Time	-	10000		-	Hrs	I_F = 20mA Note 3

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 6 LED Parallel). For each LED: I_F (1/6) =20mA, V_F (1/3) =3.3V

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F is defined for one channel LED. Optical performance should be evaluated at Ta=25℃ only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



4.0 INTERFACE CONNECTION

4.1 Module Input Signal & Power

- LVDS Signal interface : 39 Pin.

< Table 5. LCM Module Input Connector Pin Configuration >

Pin No	Symbol	I/O	Description	Remark
1	GND	P	Ground	
2	GND	P	Ground	
3	VDD	P	Power Supply 3.3V for digital circuit	
4	VDD	P	Power Supply 3.3V for digital circuit	
5	LCD_ID	O	ID Information for D-IC company	Note 2
6	Reset	I	Global reset pin	Active Low to enter Reset State
7	STBYB	I	Standly mode,Normally pulled high	Note 3
8	GND	P	Ground	
9	RXIN0-	I	-LVDS Differential Data input	
10	RXIN0+	I	+LVDS Differential Data input	
11	GND	P	Ground	
12	RXIN1-	I	-LVDS Differential Data input	
13	RXIN1+	I	+LVDS Differential Data input	
14	GND	P	Ground	
15	RXIN2-	I	-LVDS Differential Data input	
16	RXIN2+	I	+LVDS Differential Data input	
17	GND	P	Ground	
18	CLKIN-	I	-LVDS Differential CLK input	
19	CLKIN+	I	+LVDS Differential CLK input	
20	GND	P	Ground	
21	RXIN3-	I	-LVDS Differential Data input	
22	RXIN3+	I	+LVDS Differential Data input	
23	GND	P	Ground	
24	SELB	I	6bit/8bit mode select	Note 4
25	L/R	I	Horizontal inversion	Note 5
26	U/D	I	Vertical inversion	
27	GND	P	Ground	
28	DIMO	O	Backlight CABC controller signal output	Note 6
29	CABC_EN1	I	CABC H/W enable	Note 7
30	CABC_EN2	I	CABC H/W enable	
31	GND	P	Ground	
32	LED-	P	LED Cathode	
33	LED-	P	LED Cathode	
34	LED-	P	LED Cathode	
35	LED+	P	LED Anode	
36	LED+	P	LED Anode	
37	LED+	P	LED Anode	
38	GND	P	Ground	
39	GND	P	Ground	

Note.1

I/O definition : I---Input ; O---Output ; P---Power/Ground

Note.2

-LCD_ID="H (3.3V)" : Driver IC Company is Himax ;

Note.3

-STBYB="H (3.3V)": normal operation ;

-STBYB="L (GND)": timing controller, source driver will turn off, all output are High-Z

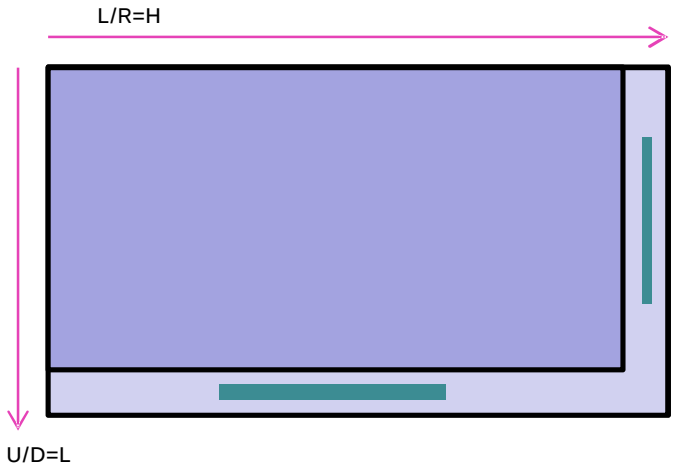
Note.4

-SELB="H (3.3V)": 6 bit ;

-SELB="L (GND)": 8 bit ;

Note.5

Scan Control Input		Scanning direction
L/R	U/D	
VDD	GND	Up to Down, Left to Right
GND	GND	Up to Down, Right to Left
VDD	VDD	Down to Up, Left to Right
GND	VDD	Down to Up, Right to Left



Note.6

-DIMO = "(GND)" : Turn off external backlight controller

-DIMO = "H (3.3V)" : Logical control signal to turn on external backlight controller

NOTE : If CABC OFF , DIMO = DIMI . Else DIMO is controlled by CABC

Note.7

-When CABC_EN="00", CABC OFF. (Default mode)

- When CABC_EN="01", User interface Image.

-When CABC_EN="10", Still Picture.

-When CABC_EN="11", Moving Image.

5.0 SIGNAL TIMING SPECIFICATIONS

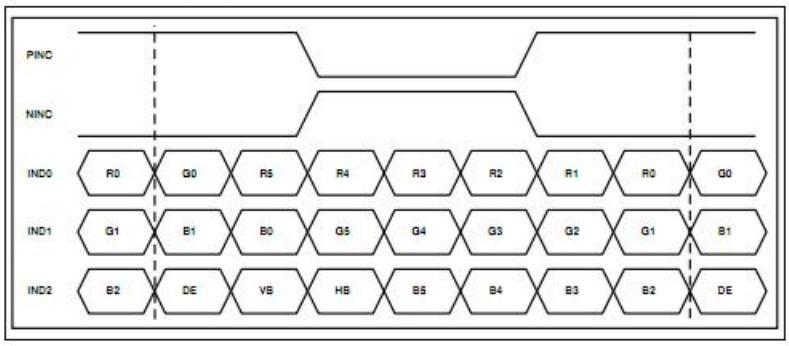
5.1 Timing Parameters (DE only mode)

< Table 6. Timing Table >

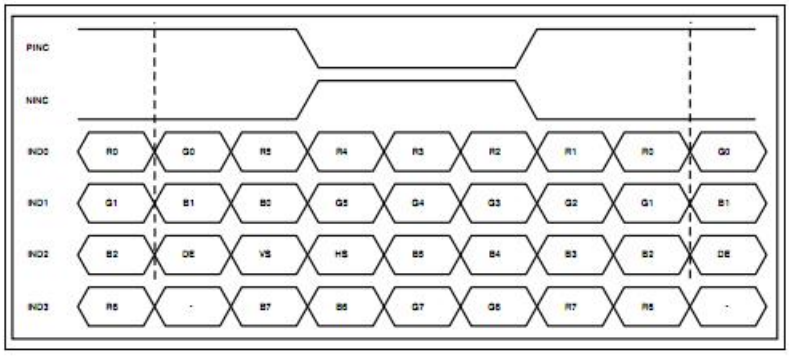
ITEM	Symbol		Min	Typ	Max	Unit	Note
CLK	Period	t_{CLK}	14.9	19.5	24.5	ns	
	Frequency	-	40.8	51.2	67.2	MHz	
Hsync	Period	t_{HP}	1114	1344	1400	t_{CLK}	
	Frequency	f_H	36	38.1	45	KHz	
Vsync	Period	t_{VP}	610	635	800	t_{HP}	
	Frequency	f_V	-	60	-	Hz	
Horizontal Active Display Term	Valid	t_{HV}	-	1024	-	t_{CLK}	
	Total	t_{HP}	1114	1344	1400	t_{CLK}	
Vertical Active Display Term	Valid	t_{VV}	-	600	-	t_{HP}	
	Total	t_{VP}	610	635	800	t_{HP}	

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

6bit LVDS input (HSD='H')



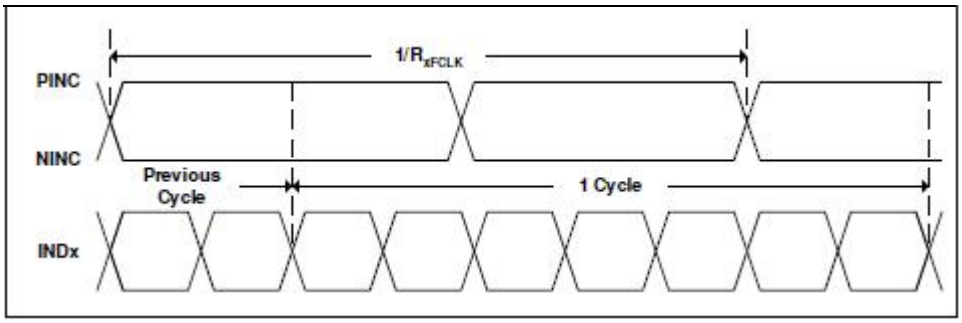
8-bit LVDS input (HSD='L')

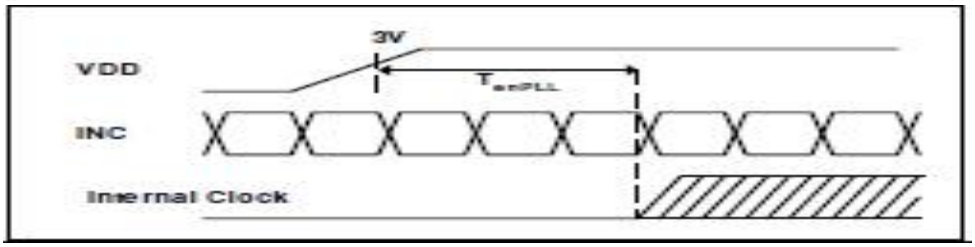


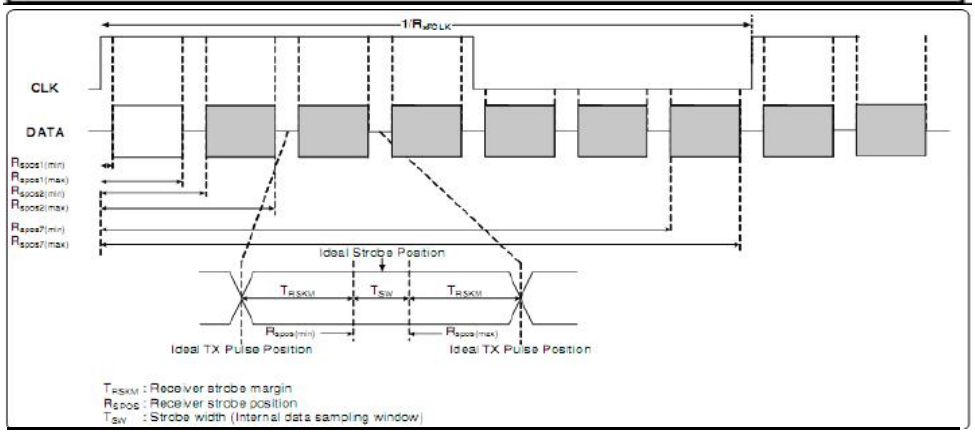
5.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 7.

Parameters	Symbols	Min	Typ	Max	Unit	Condition
Clock frequency	RxFCLK	40.8	51.2	67.2	MHz	
Input data skew margin	TRSKM	500	-	-	ps	|VID|=400mV RxVCM=1.2V RxFCLK=71MHz
Clock high time	TLVCH	-	4/(7*RxFCLK)		ns	
Clock low time	TLVCL		3/(7*RxFCLK)		ns	
PLL wake-up time	TenPLL			150	us	



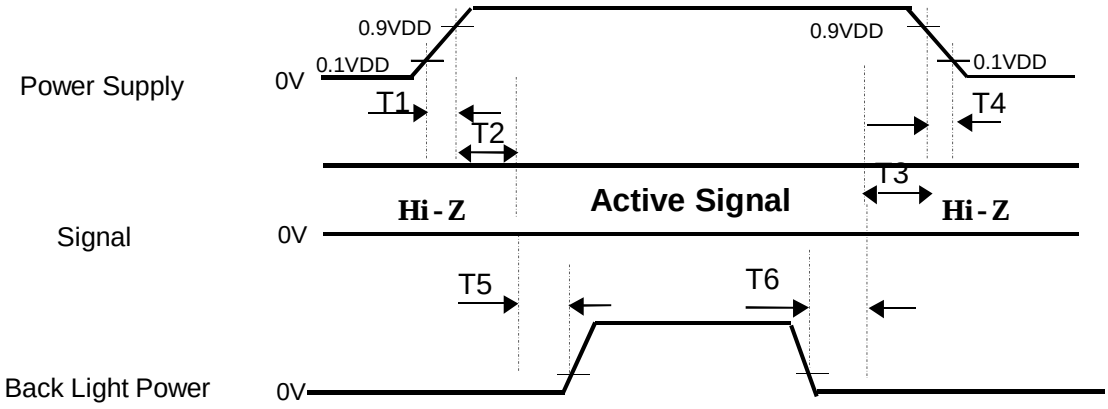




5.3 Input Signals, Basic Display Colors & Gray Scale Of Colors

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
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
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	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
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
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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
Gray Scale of White	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
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	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

5.4 Power Sequence



- 0.5ms ≤ T1 ≤ 10 ms
- 0 ms ≤ T2
- 0 ms ≤ T3
- 0 ms ≤ T4 ≤ 10ms
- 0 ms ≤ T5 ≤ 100ms
- 0 ms ≤ T6 ≤ 10ms

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

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 TOPCON BM-5) 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. Gray scale reversal occur in 12 o 'clock direction. Optimum viewing angle direction is 6 'clock,.

. [VDD = 3.3V, Frame rate = 60Hz, Ta =25±2 ℃]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10		70		Deg.	Note 1
		Θ_9			70		Deg.	
	Vertical	Θ_{12}			70		Deg.	
		Θ_6			60		Deg.	
Color Temperature				-	6,500		K	
Color Gamut					50		%	NTSC
Contrast ratio		CR	Θ = 0° (Center) Normal Viewing Angle	500:1	700:1	-		Note 2
Luminance of White		Y_w		300	350	-	cd/m²	Note 3
White luminance uniformity		ΔY5		80	-		%	Note 4
		ΔY13		60	-		%	
Reproduction of color	White	W_x		TYP. - 0.05	0.313	TYP. + 0.05		Note 5
		W_y			0.329			
	Red	R_x			0.582			
		R_y			0.344			
	Green	G_x			0.350			
		G_y			0.595			
	Blue	B_x			0.160			
		B_y			0.129			
Response Time		T_g		-	20	-	ms	Note 6
Gamma Scale				2.0	2.2	2.4		

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 θ= 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. Center Luminance of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.
4. The White luminance uniformity on LCD surface is then expressed as : ΔY =Minimum Luminance of 5(or 13) points / Maximum Luminance of 5(or 13) points. (see FIGURE 2 and FIGURE 3).
5. The color chromaticity coordinates specified in Table 4. 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.
6. The electro-optical response time measurements shall be made as FIGURE 3 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td, and 90% to 10% is Tr.

7.0 MECHANICAL CHARACTERISTICS

7.1 Dimensional Requirements

FIGURE 4 (located in Appendix) shows mechanical outlines for the model BA070WS1-100. Other parameters are shown in Table 12.

<Table 12. Dimensional Parameters>

Parameter	Specification	Unit
Dimensional outline	167.25(H) × 104.65(V) × 2.8(body) (typ.)	mm
Weight	110 (max.)	gram
Active area	153.6(W) x 90(H)	mm
Pixel pitch	0.15(H) ×0.15(V)	mm
Number of pixels	1024(H) ×600(V) (1 pixel = R + G + B dots)	pixels
Back-light	LED	

7.2 Mounting

See FIGURE 6. (shown in Appendix)

7.3 AG and Polarizer Hardness.

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

8.0 RELIABLITY TEST

The Reliability test items and its conditions are shown in below.

<Table 13. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 80 ℃, 120 hrs
2	Low temperature storage test	Ta = -30℃, 120 hrs
3	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 120hrs
4	High temperature operation test	Ta = 70 ℃, 120hrs
5	Low temperature operation test	Ta = -20℃, 120hrs
6	Thermal shock	Ta = -30℃ ↔ 80 ℃ (0.5 hr), 100 cycle
7	Vibration test (non-operating)	Packing Vibration： 1.47Grms, 1~200Hz, Random + X, + Y, ±Z per 30min
8	Drop test (non-operating)	Drop： 1Angle, 3Edge, 6FAce Height：依据 JIS-Z-0200 level 1
9	Electro-static discharge test	TBD

9.0 Product Serial Number

1	2	3	4	5	6	7
X X	X	X	X X	1	0 0 X X	X X X X X X

Type designation

No 1. Control Number

No 2. Rank / Grade

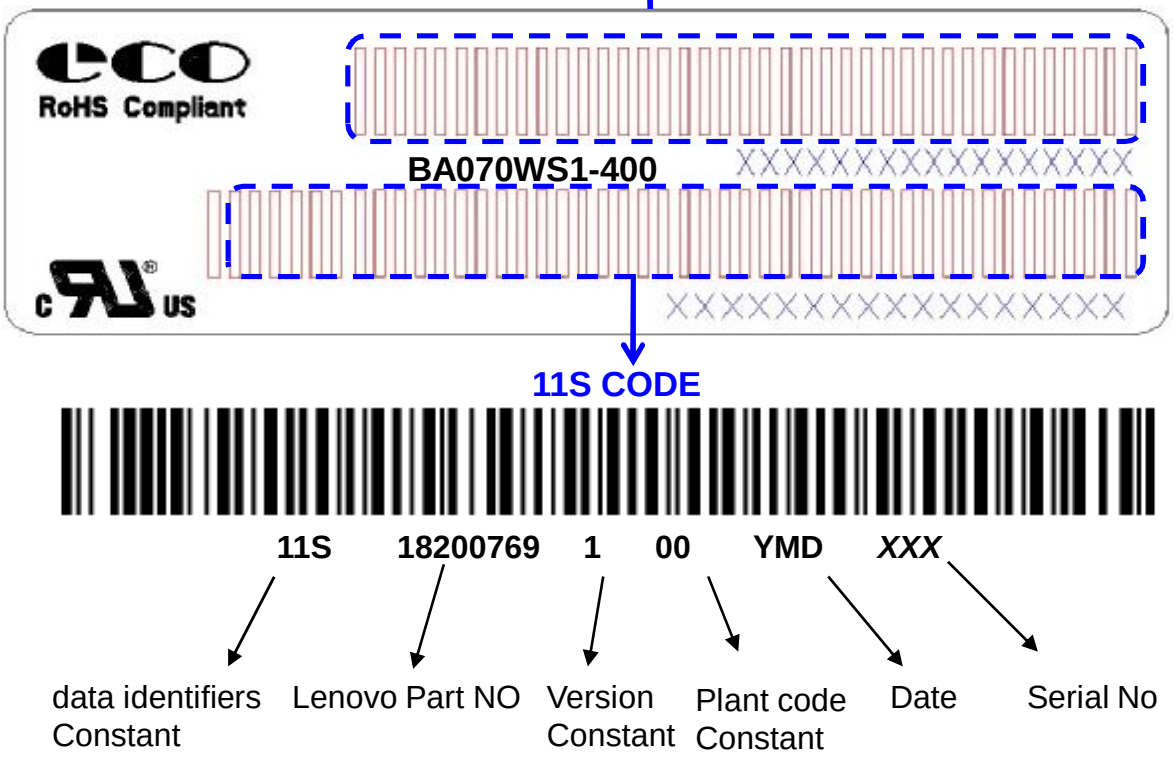
No 3. Line classification

No 4. Year (10 : 2010, 11: 2011, …)

No 5. Month (1, 2, 3, …, 9, X, Y, Z)

No 6. Product Identification (FG)

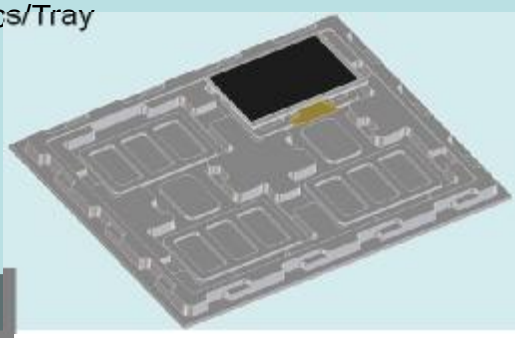
No 7. Serial Number



10.0 PACKING INFORMATION

-. 将 4pcs MDL 平放入Tray, Panel 面向上放置

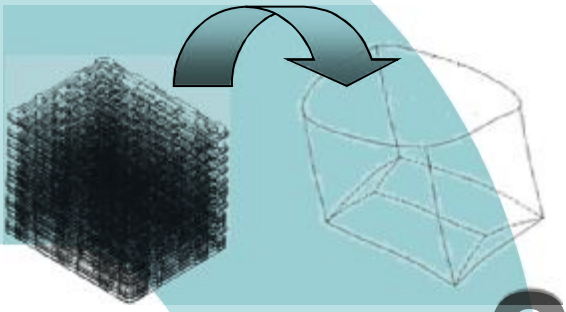
-. 容量: 4pcs/Tray



step 1

-. 将17pcs PET Tray 平放入PE Bag

-. 容量: 64pcs/PE Bag

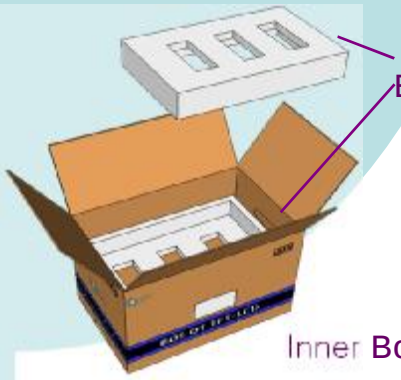


step 2

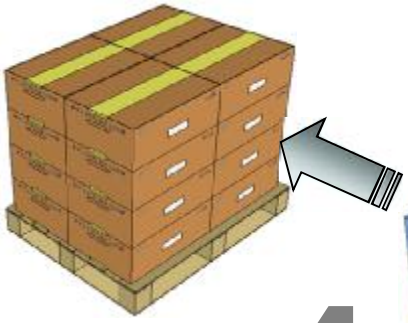
-.将PET Tray堆码后平放入Inner Box
上下放置EPE Board

-. 人工方式

-. 容量：64pcs/Inner Box



step 3



step 4

-. 每个Pallet上放4层Box, 1层4箱,共计16ea Box

-. Pallet 四边及打包带位置放置纸护角后,以缠绕膜包裹

-. 容量: 1024pcs/Pallet

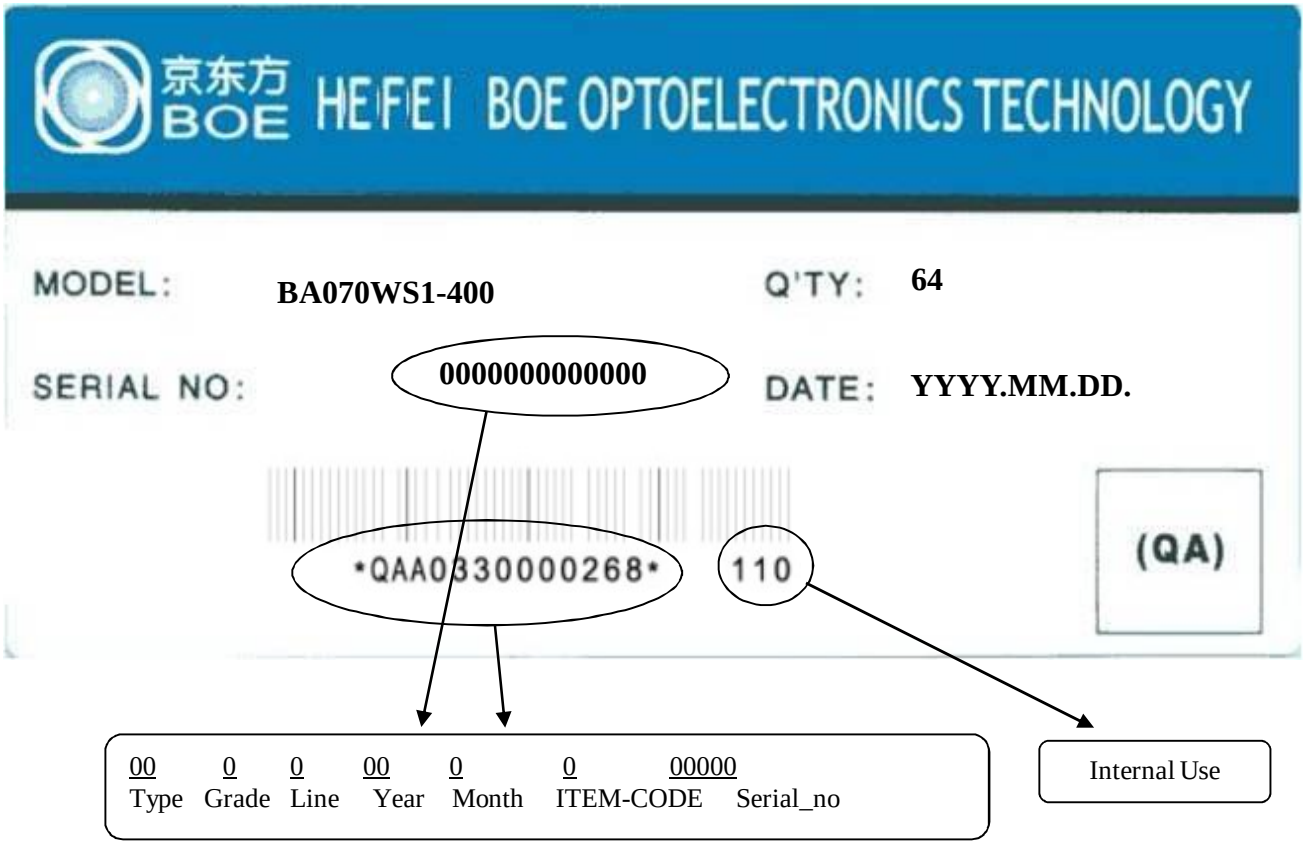
10.2 Packing Note

- Box Dimension : 510mmL× 410mmW× 252mmH
- Package Quantity in one Box : 64pcs

10.3 Box label

- Label Size : 108 mm (L) 56 mm (W)
- Contents

  Model : BA070WS1-100
  Q`ty : 46 Module 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

(1) Cautions when taking out the module

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

(2) Cautions for handling the module

- As the electrostatic discharges may break the LCD module, handle the LCD module 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 module 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 module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation

- When the module 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 module would be damaged.

(4) Cautions for the atmosphere

- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module 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 module characteristics

- Do not apply fixed pattern data signal to the LCD module 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 module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

12.0 APPENDIX

Figure 1. Measurement Set Up

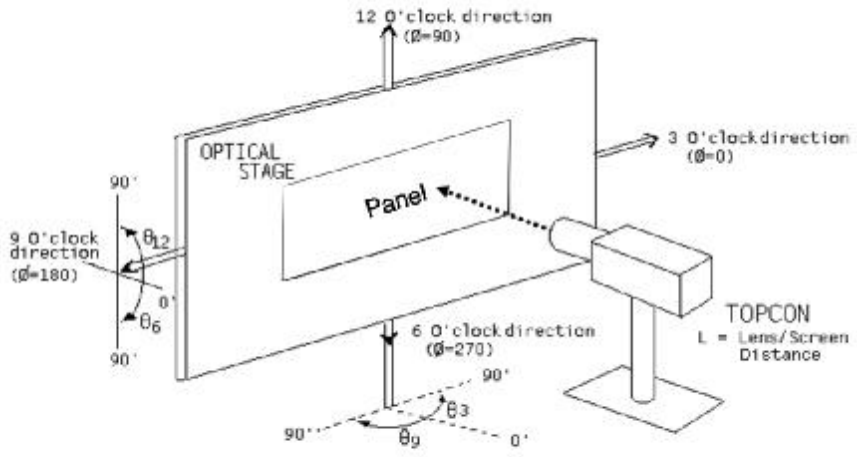
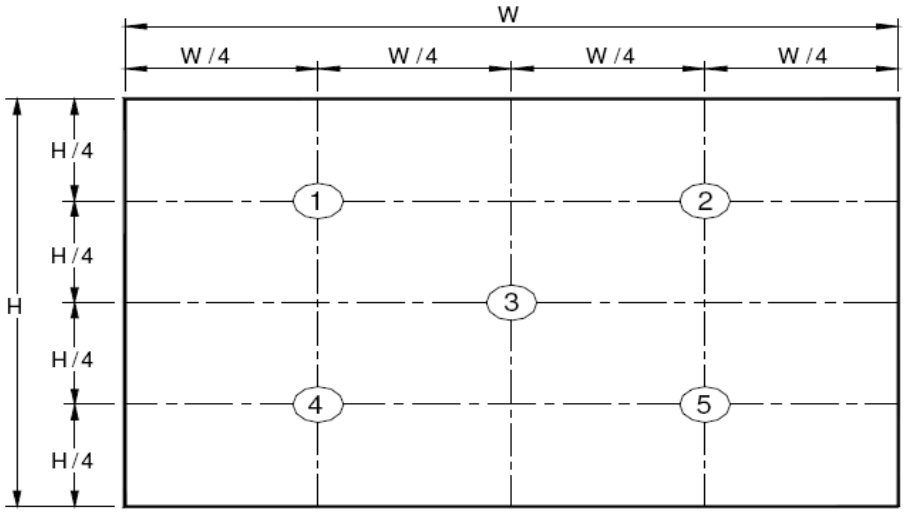
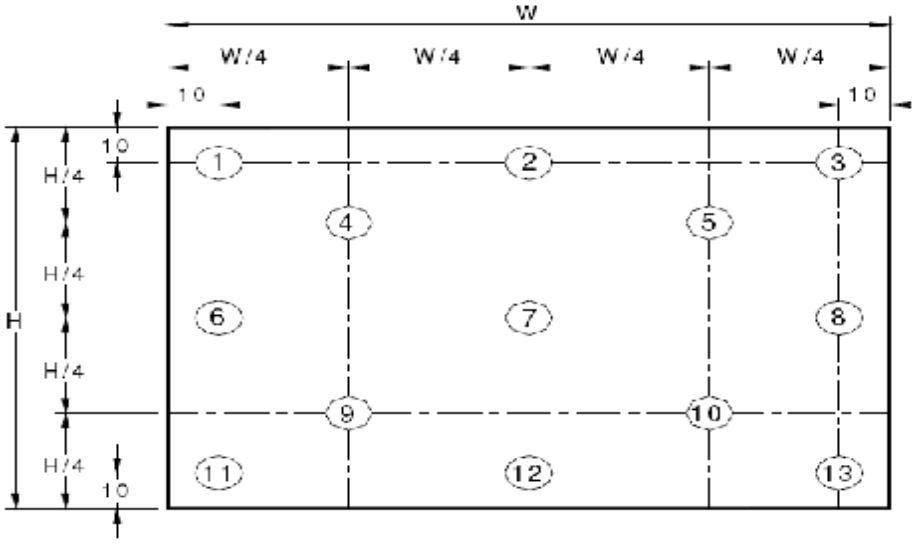


Figure 2. White Luminance and Uniformity Measurement Locations (5 points)



Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 3. Uniformity Measurement Locations (13 points)



The White luminance uniformity on LCD surface is then expressed as : ΔY5 = Minimum Luminance of five points / Maximum Luminance of five points (see FIGURE 2) , ΔY13 = Minimum Luminance of 13 points /Maximum Luminance of 13 points (see FIGURE 3).

Figure 4. Response Time Testing

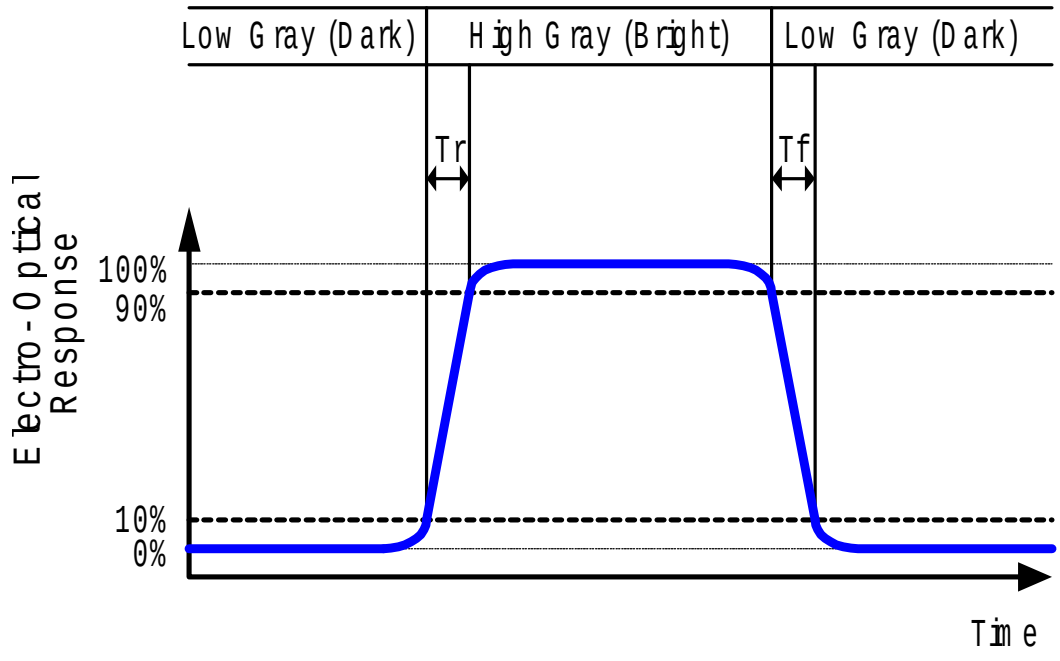


Figure 5. TFT-LCD Module Outline Dimensions (Front view)

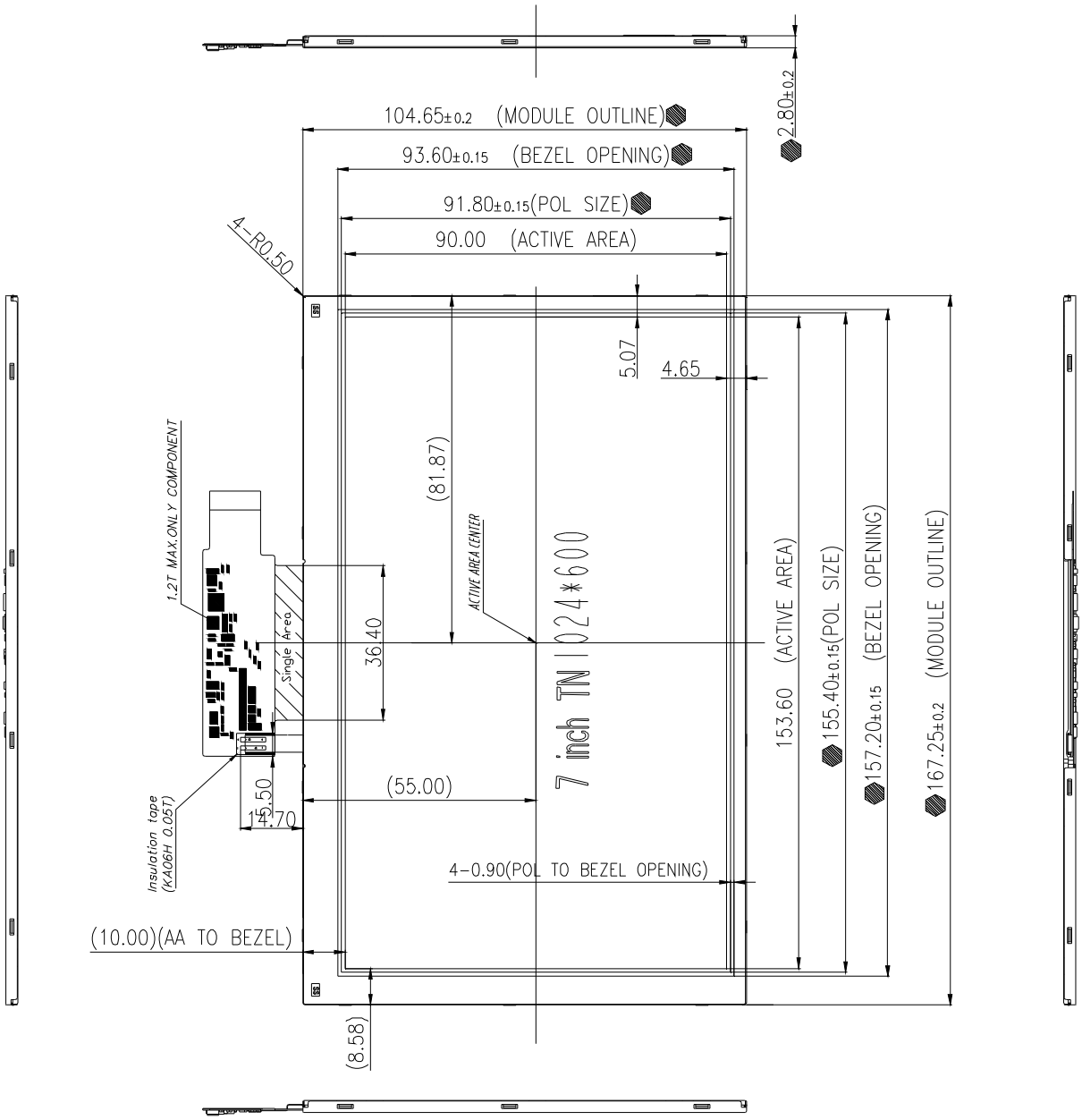


Figure 6. TFT-LCD Module Outline Dimensions (Rear view)