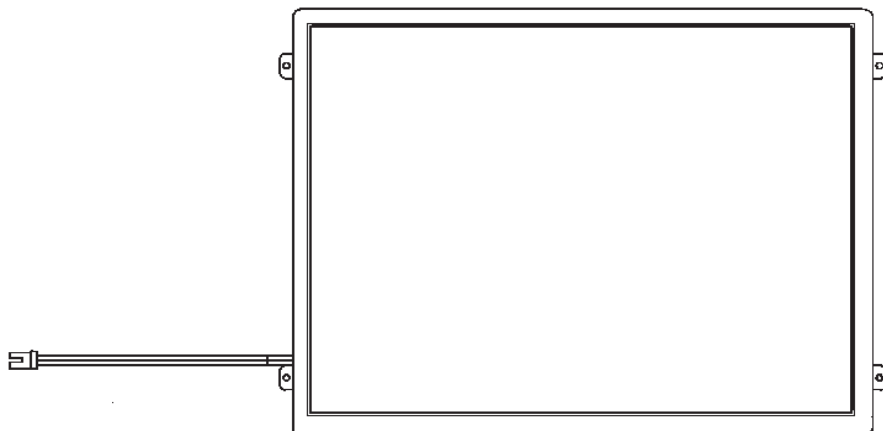




PRODUCT SPECIFICATION

HDA1040X-AH

10.4", TFT XGA (1024X768) COLOR
LCD DISPLAY MODULE



HANTRONIX, INC.
10080 BUBB RD.
CUPERTINO, CA 95014

Q.A.:
Z.W.

REV.:
1.0

HDA1040X-AH

SHEET 1 OF 19

DATE:
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1. OVERVIEW

HDA1040X-AH is 10.4" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, a driving circuit, and a LED backlight. This 10.4" TFT LCD module has a high resolution image that is composed of 1024×768 pixel elements in a stripe arrangement. Display 262K colors by 6 Bit R.G.B signal input. The most important thing is that this TFT LCD module with high brightness LED backlight. The LCM brightness is reached **1000** cd/m².

General specification are summarized in the following table:

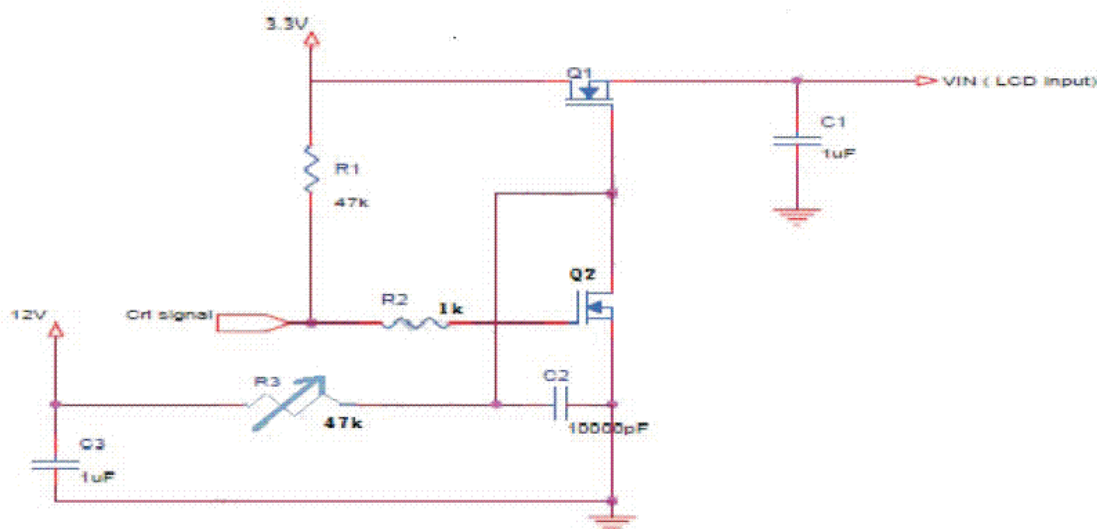
Item	Specifications	unit
Panel Size	10.4 (panel Diagonal)	inch
Display Area	211.2 (W) x 158.4(H)	mm
Number of Pixels	1024(H) x 3(RGB) x 768(V)	-
Overall dimension	236.0(W)x174.3x7.4(D)(with PWB & components)	mm
Color configuration	R.G.B -stripe	-
Display Mode	Normally white	mm
Number of colors	262,144	colors
Brightness	1000	cd/m ²
Backlight Unit	LED	
Electrical Interface	LVDS 6 bits	
Weight	TBD	g
Surface Treatment	Anti-Glare, Hardness 3H	

2. ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

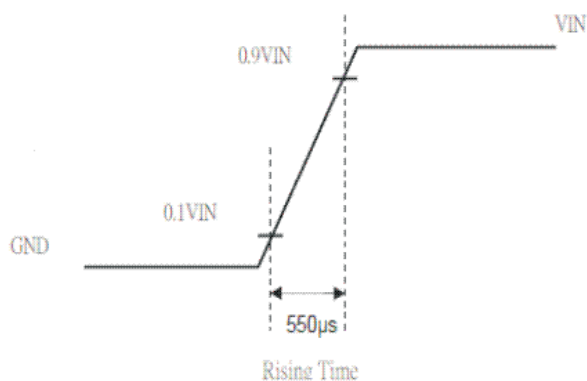
ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	V _{cc}	-0.3	4.0	V	
LED Supply Voltage	V _{LED}		10.65	V	
ICC Rush Current	IRUSH	-	1	A	(Note 2)
Operation Temperature	T _{op}	-20	70	°C	(Note 1)
Storage Temperature	T _{stg}	-30	80	°C	(Note 1)

(Note1) If users use the product out off the environment operation range (temperature



Control signal : High(+3.3V) → Low(GND)

Supply Voltage of rising time should be from R3 and C2 tune to 550 us.



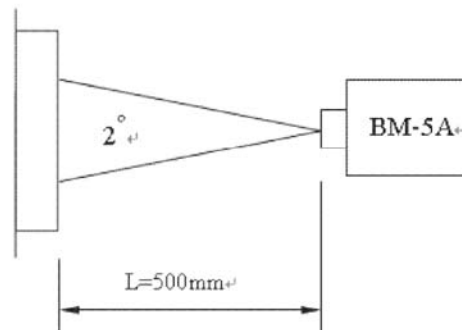
3. OPTICAL CHARACTERISTICS

$T_a = 25^{\circ}\text{C}$, $V_{cc} = 3.3\text{V}$

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio		CR	Point-5	400	500	-	-	*1)*2)*3)
Luminance*)		Lw	Point-5	800	1000	-	cd/m ²	*1)*3)
Luminance Uniformity		ΔL		70	75		%	*1)*3)
Response Time (Whit-Black)		Tr+Tf	Point-5		25	30	ms	*1)*3)*5)
Viewing Angle	Horizontal	Ψ	$CR \geq 10$		140	-	°	*1)*2)*4)
	Vertical	θ	Point-5		120	-	°	*1)*2)*4)
NTSC					(50)		%	
Color Coordinate	White	Wx	$\Psi = \theta = 0^{\circ}$ Point-5	0.273	0.313	0.353	-	*1)*3)
		Wy		0.289	0.329	0.369		
	Red	Rx			TBD			
		Ry			TBD			
	Green	Gx			TBD			
		Gy			TBD			
	Blue	Bx			TBD			
		By			TBD			

NOTE :

*1) Measure condition : $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, $60 \pm 10\% \text{RH}$, under 10 Lux in the dark room. BM-5A (TOPCON), viewing angle 2° , $V_{adj} = 3.3\text{V}$, Duty 100% or $I_L = 260\text{mA}$, After 10 minutes operation



*2) Definition of contrast ratio :

Contrast Ratio (CR) = (White) Luminance of ON \div (Black) Luminance of OFF

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- 3) Definition of luminance : Measure white luminance on the point 5 as figure 3-3
 Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure3-3

$$\Delta L = [L(\text{MIN})/L(\text{MAX})] \times 100$$

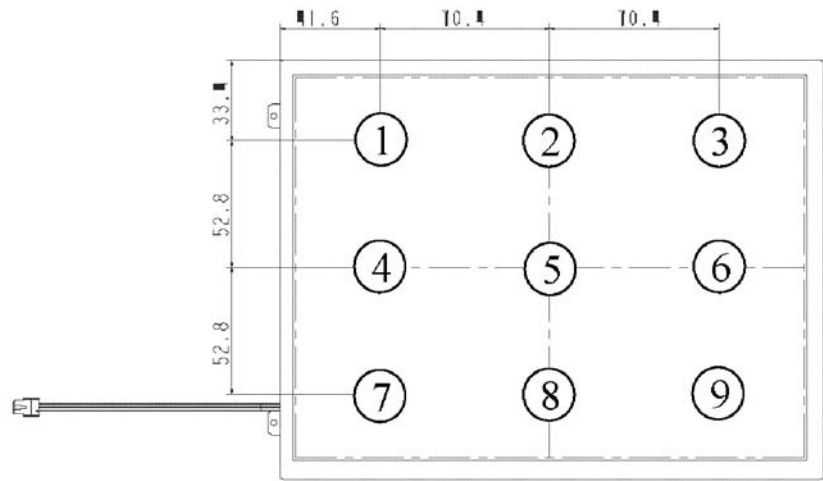


Fig 3-3 Measuring point

- *4) Definition of Viewing Angle(ϕ, θ), refer to Fig 3-4 as below:
 These items are measured by EZ-CONTRAST (ELDIM) in the dark room. (no ambient light).

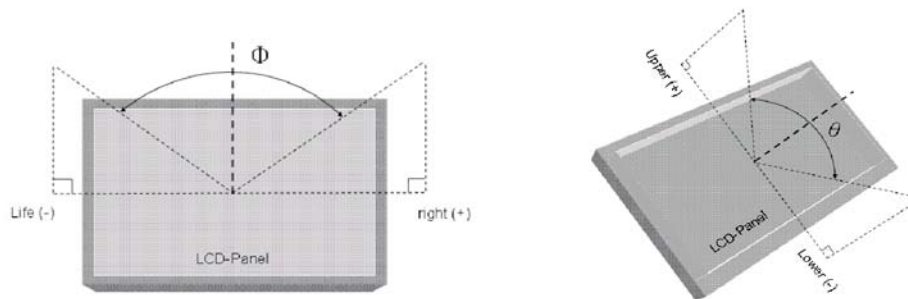


Fig 3-4 Definition of Viewing Angle

- *5) Definition of Response Time.(White-Black)

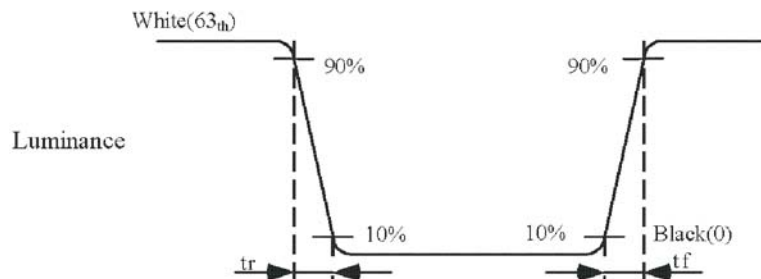


Fig 3-5 Definition of Response Time(White-Black)

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4. ELECTRICAL CHARACTERISTICS

4.1 TFT LCD Power Voltage

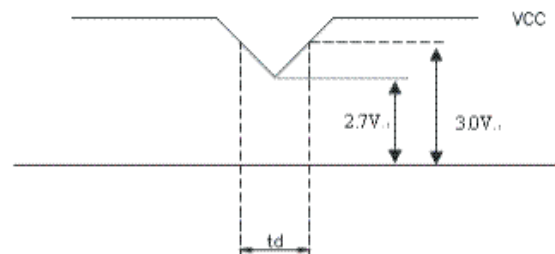
Ta=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Power Supply Voltage For LCD	V _{CC}	3.0	3.3	3.6	V	(Note 1)
Logic Input Voltage (LVDS:IN+,IN-)	Common Mode Voltage	V _{CM}	1.08	1.2	V	(Note 2)
	Differential Input Voltage	V _{ID}	250	350	mV	(Note 2)
	Threshold Voltage(high)	V _{TH}	-	-	mV	(Note 2)
	Threshold Voltage(low)	V _{TL}	-100	-	mV	(Note 2)

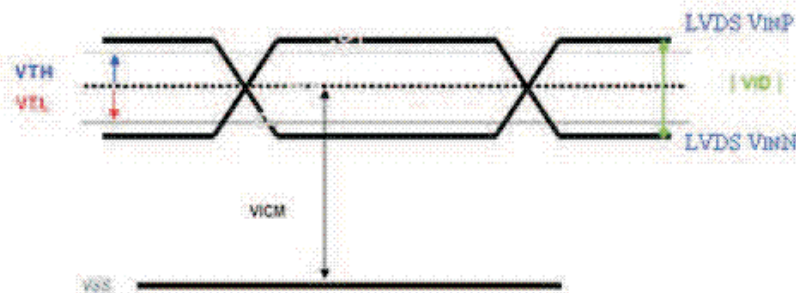
Remarks :

(Note1) VCC –dip condition:

- 1) When $2.7\text{V} \leq V_{CC} < 3.0\text{V}$, $t_d \leq 10\text{ms}$.
- 2) $V_{CC} > 3.0\text{V}$, VCC-dip condition should be same as VCC-turn-on condition.



(Note 2) LVDS signal



4.2 TFT-LCD Current Consumption

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LCD Power Current	I_{cc}	--	450	500	mA	(Note 1)

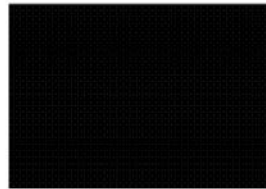
(Note1) (Frame rate = 60 Hz)

Typical: Under 64 gray pattern @ $V_{cc} = 3.3\text{ V}$

Maximum: Under black pattern @ $V_{cc} = 3.0\text{ V}$

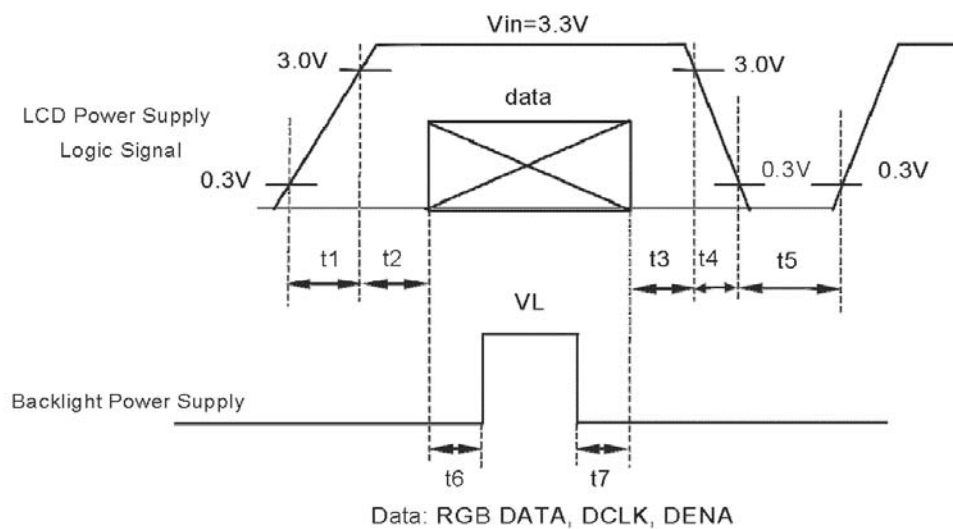


(a) 64 Gray Pattern



(b) Black Pattern

4.3 Power Signal sequence



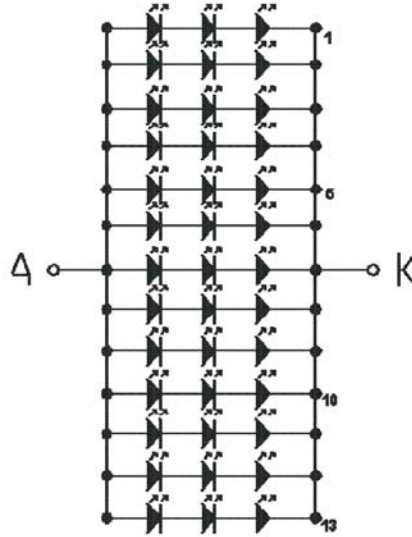
$$\begin{aligned}
 0.5 < t1 &\leq 10\text{ms} & 200\text{ms} &\leq t5 \\
 0 < t2 &\leq 50\text{ms} & 200\text{ms} &\leq t6 \\
 0 < t3 &\leq 50\text{ms} & 200\text{ms} &\leq t7 \\
 0 < t4 &\leq 10\text{ms}
 \end{aligned}$$

5. BACKLIGHT DRIVING CIRCUIT:

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK
LED current	IL	Ta=25℃	--	520	--	mA	Note 1,2
LED voltage	VL	Ta=25℃	9.0	9.6	10.2	V	Note 1,2
Power consumption	WL	Ta=25℃	--	4992	--	mW	Note 1,2
LED Lifetime	-	Ta=25℃	40000	45000	--	Hr	Note 3,4,5

Remarks :

*1) LED Circuit Diagram:



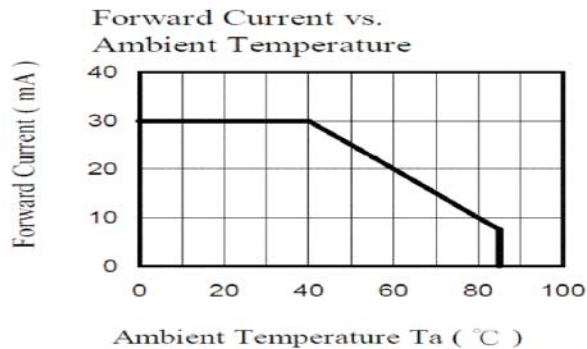
*2) A : Anode(+), K : Cathode(-)

*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

*4) DEFINITION OF LED LIFETIME : LUMINANCE < INITIAL LUMINANCE 50%

*5) If Conditions : Pulse Width $\leq 10\text{msec}$, Duty $\leq 1/10$.

One of Every LED must be satisfied as below figure.



6. INTERFACE CONNECTION

LCD connector (30pin) : STARCONN, P/N : MSBK2407P30D or other of the same class

Pin No.	SYMBOL	FUNCTION
1	GND	Ground
2	Vcc	+3.3V Power
3	Vcc	+3.3V Power
4	NC	NC
5	NC	NC
6	NC	NC
7	GND	GND
8	RXIN0-	LVDS Signal(-)—channel 0
9	RXIN0+	LVDS Signal(+)—channel 0
10	GND	Ground
11	RXIN1-	LVDS Signal(-)—channel 1
12	RXIN1+	LVDS Signal(+)—channel 1
13	GND	Ground
14	RXIN2-	LVDS Signal(-)—channel 2
15	RXIN2+	LVDS Signal(+)—channel 2
16	GND	Ground
17	RXCLKIN-	LVDS Clock Signal(-)
18	RXCLKIN+	LVDS Clock Signal(+)
19	GND	Ground
20	NC	NC
21	NC	NC
22	GND	Ground
23	GND	Ground
24	NC	NC
25	NC	NC
26	NC	NC
27	NC	NC
28	NC	NC
29	NC	NC
30	NC	NC

(Note)

- 1) GND Pin must be connected to ground. Don't be floating.
- 2) NC Pin must be floating.

Back Light Connector:

Pin No	Symbol	Function	Wire Color
1	LEDA	LED driving anode (high voltage)	Red
2	LEDK	LED driving cathode (low voltage)	Whit

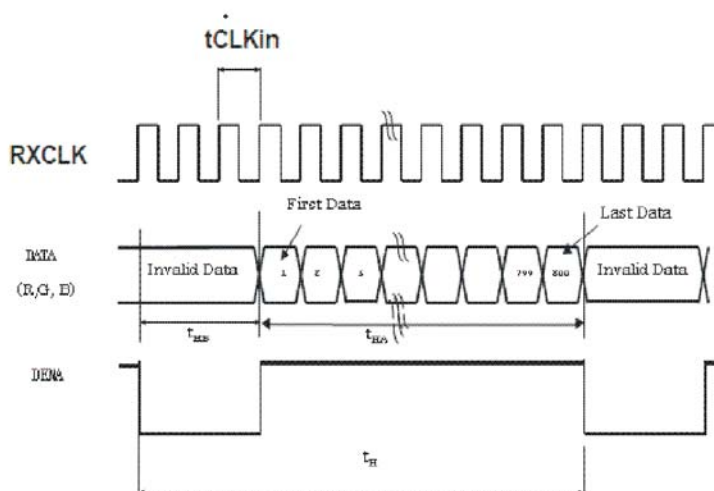
7. INPUT SIGNAL(DE ONLY MODE)

7.1 Timing Specification

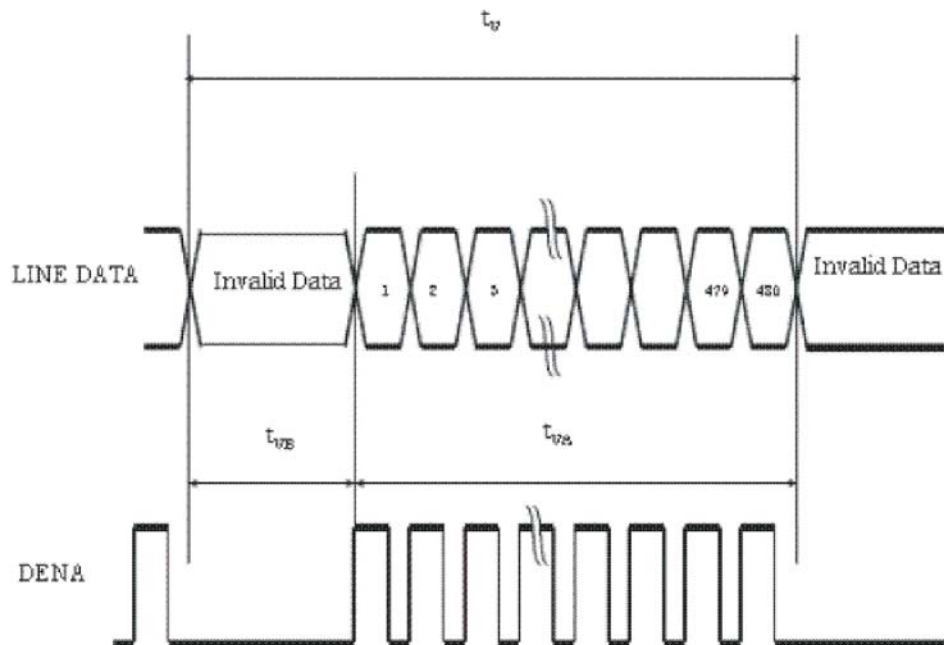
ITEM				SYMBOL	MIN.	TYP.	MAX.	UNIT
LVDS Input Signal Sequence	CLK Frequency			fCLKin	51	65	71	MHz
LCD Input Timing	DENA	Horizontal	Horizontal Period	t _H	1160	1344	1350	tCLK
			Horizontal Valid	t _{HA}	1024			tCLK
			Horizontal Blank	t _{HB}	136	320	326	tCLK
		Vertical	Frame	f _V	55	60	65	Hz
			Vertical Period	t _V	790	806	810	t _H
			Vertical Valid	t _{VA}	768			t _H
			Vertical Blank	t _{VB}	22	38	42	t _H

7.2 Timing sequence (Timing chart)

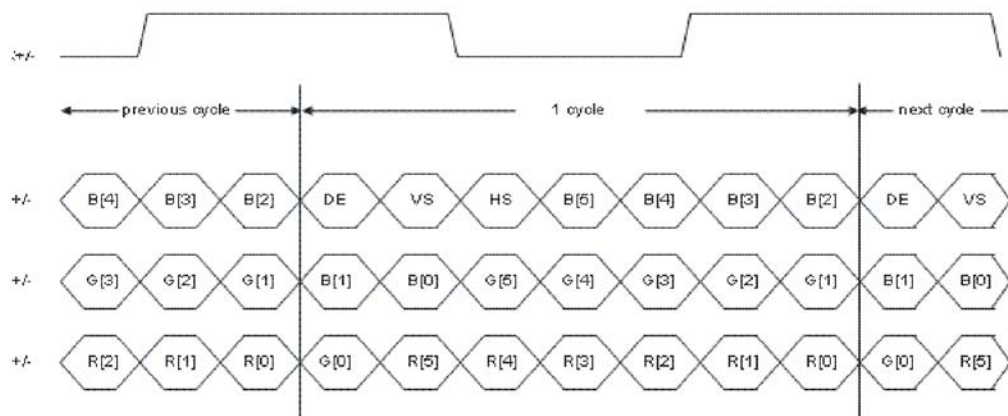
7.2.1 Horizontal Timing Sequence



7.2.2 Vertical Timing Sequence



7.2.3 LVDS Input Data mapping



7.3 Color data assignment

COLOR	INPUT	R DATA						G DATA						B DATA					
	DATA	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	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
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

(Note1) Definition of Gray Scale color(n) : (n) means the level of gray scale, the larger (n) means the brighter level.

(Note2) Data:1-High, 0-Low

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8. QUALITY AND RELIABILITY

8.1 TEST CONDITIONS

Tests should be conducted under the following

conditions : Ambient temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $60 \pm 25\% \text{ RH}$.

8.2 SAMPLING PLAN

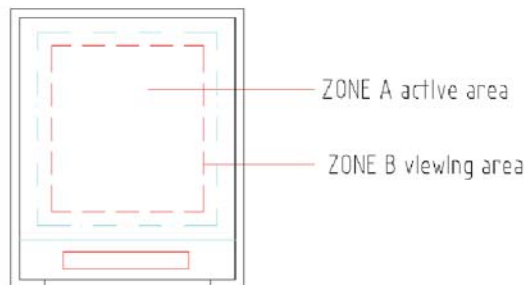
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

8.3 ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

8.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.



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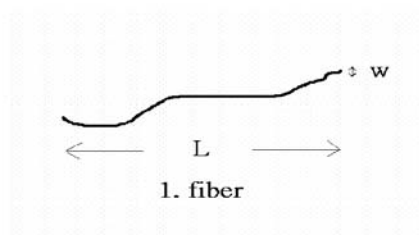
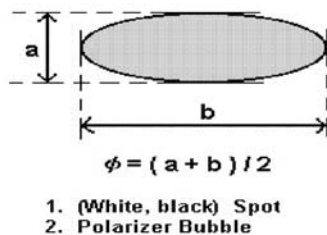
8.5 INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL

DEFECT TYPE			LIMIT				Note		
VISUAL DEFECT	INTERNAL	SPOT	$\phi < 0.15\text{mm}$		Ignore		Note1		
			$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$		$N \leq 4$				
			$0.5\text{mm} < \phi$		$N = 0$				
		FIBER	$0.03\text{mm} < W \leq 0.1\text{mm}, L \leq 5\text{mm}$		$N \leq 3$		Note1		
			$1.0\text{mm} < W, 1.5\text{mm} < L$		$N = 0$				
		POLARIZER BUBBLE	$\phi < 0.15\text{mm}$		Ignore		Note1		
			$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$		$N \leq 2$				
			$0.5\text{mm} < \phi$		$N = 0$				
		Mura	It' OK if mura is slight visible through 6%ND filter						
ELECTRICAL DEFECT		BRIGHT DOT	A Grade			B Grade			
			C Area	O Area	Total	C Area	O Area	Total	Note3
			$N \leq 0$	$N \leq 2$	$N \leq 2$	$N \leq 2$	$N \leq 3$	$N \leq 5$	Note2
		DARK DOT	$N \leq 2$	$N \leq 3$	$N \leq 3$	$N \leq 3$	$N \leq 5$	$N \leq 8$	
		TOTAL DOT	$N \leq 4$			$N \leq 5$	$N \leq 6$	$N \leq 8$	Note2
		TWO ADJACENT DOT	$N \leq 0$	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	Note4
		THREE OR MORE ADJACENT DOT	NOT ALLOWED						
		LINE DEFECT	NOT ALLOWED						

(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

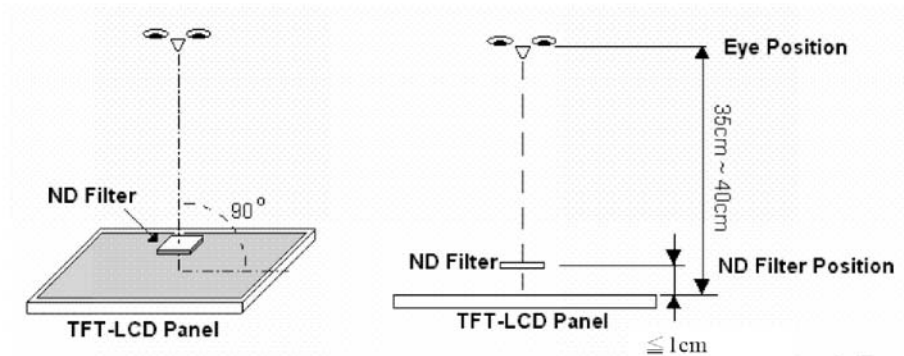
(2) LITTLE BRIGHT DOT ACCEPTABLE UNDER 6 % ND-Filter

[Note1] W : Width[mm], L : Length[mm], N : Number, ϕ : Average Diameter

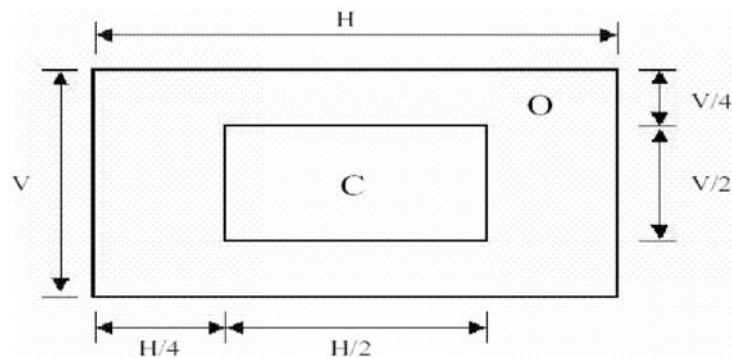


[Note2] Bright dot is defined through 6% transmission ND Filter as following.

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[Note3]

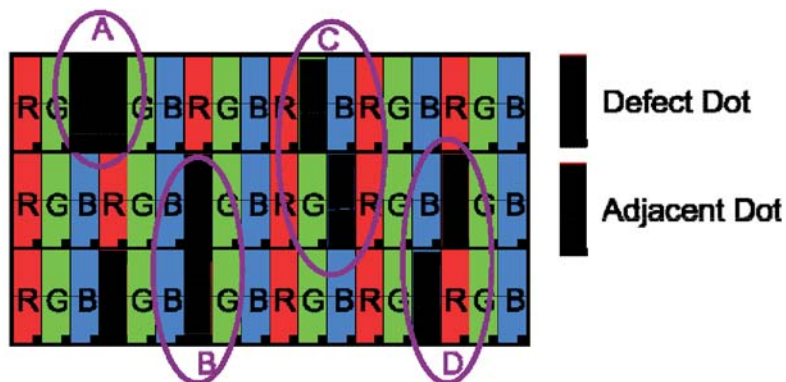


C Area: Center of display area

O Area: Outer of display area

[Note4]

Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.



- (1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.
- (2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

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8.6 Reliability Test

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 hrs	1,2
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 min. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	60 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

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9. USE PRECAUTIONS

9.1 Handling precautions

- 1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
- 2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
- 3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
- 4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

9.2 Installing precautions

- 1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1M Ω and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
- 2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
- 3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
- 4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

9.3 Storage precautions

- 1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
- 2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
- 3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

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9.4 Operating precautions

- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
- 2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
- 3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC drive voltage.
- 4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
- 5) Make certain that each signal noise level is within the standard (L level: $0.2V_{dd}$ or less and H level: $0.8V_{dd}$ or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
- 6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
- 7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
- 8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

9.5 Other

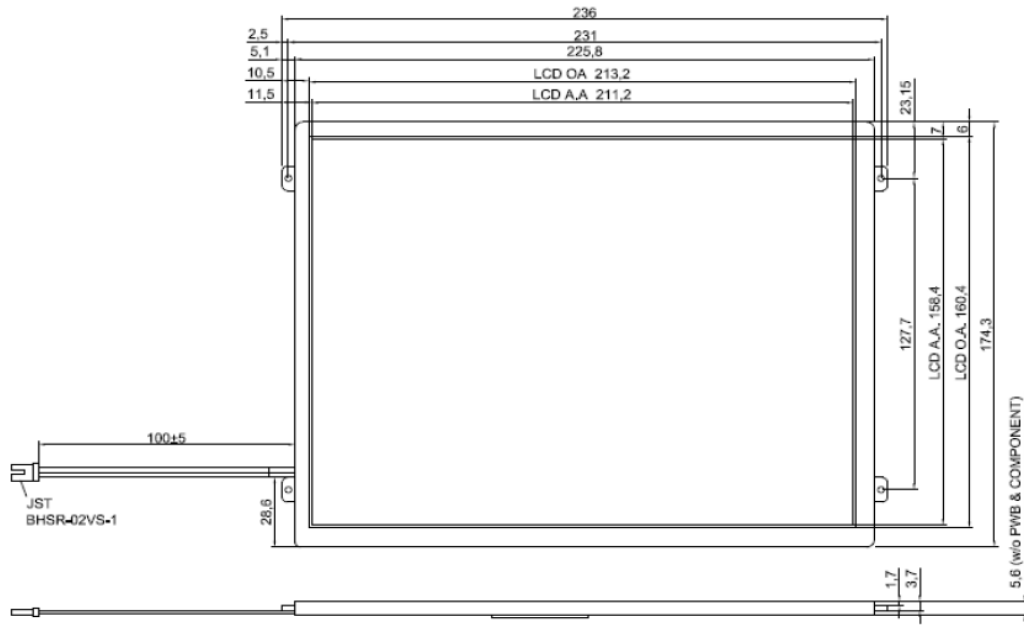
- 1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
- 2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
- 3) AMIPRE will provide one year warranty for all products and three months warrantee for all repairing products.

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10. MECHANICAL DIMENSION

10.1 Front Side

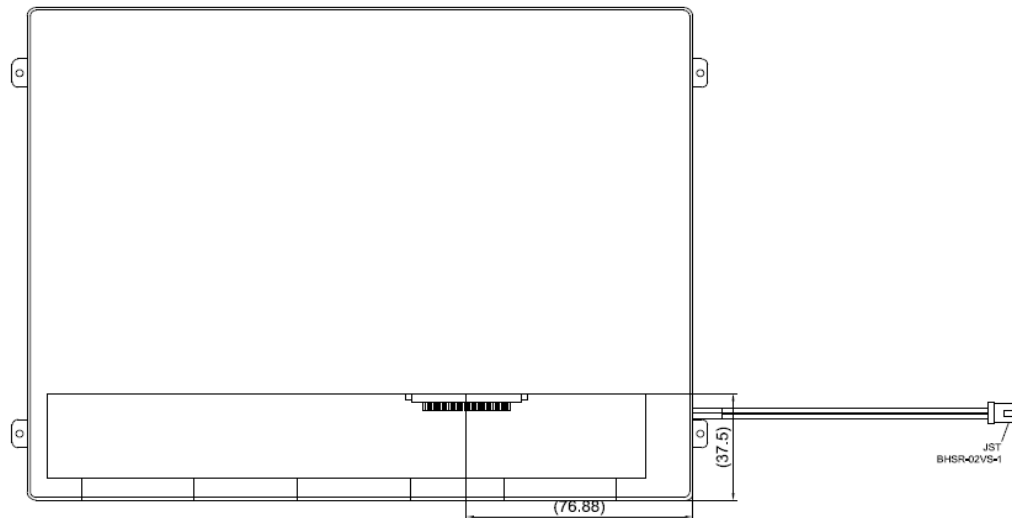
[Unit : mm]



[Note] : Tolerance is $\pm 0.3\text{mm}$ unless noted

10.2 Rear Side

[Unit : mm]



[Note] : Tolerance is $\pm 0.3\text{mm}$ unless not noted

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