



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM800480ATMCW00
APPROVED BY	
DATE	2005/04/25

- Approved For Specifications
 Approved For Specifications & Sample

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APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Page	Contents	Editor
	-	New Release	

1 Introduction

Ampire Display Module **AM800480ATMCW00** is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device . This model is composed of a TFT-LCD panel , a driving circuit and a backlight system . This TFT-LCD has a WVGA resolution(800(R.G.B) X 480) and can display up to 262,144 colors .

1-1. Features

WVGA(16:9 diagonal) configuration

6 Bits color driver with 1 channel TTL interface (30 pin X 2)

1-2. Applications

Portable TV

Portable DVD

Multimedia applications and Others AV system

2 Physical specifications

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 480(H)	dots
Active area	196.8 (W) x 116.88 (H)	mm
Pixel pitch	0.082RGB (W) x 0.2435 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	211.4(W)x131.7(H)x6.1(D)---(Typ)	mm
Weight	287(Typ)	g
Surface treatment	Antiglare , Hard-Coating(3H)	
Backlight unit	Single CCFL (L type Side-Light)	
Display color	262,144	colors

3 Absolute max. ratings

3-1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	DV _{CC}	-0.5	5.5	V	GND=0
	V _{GH}	-0.3	42	V	GND=0
	V _{GL}	-20	0.3	V	GND=0
	AV _{CC}	-0.5	13.5	V	AGND=0
Input Signal voltage	V _I	-0.5	DV _{CC} +0.5	V	
	VGMA(1~7)	0.4AV _{CC}	AV _{CC} +0.3	V	
	VGMA(8~14)	-0.3	0.6AV _{CC}	V	

3-2 Back-Light Unit

Item	Symbol	Min.	Max.	Unit	Note
Lamp voltage	V _{FL}	0	1500	V _(rms)	(1) (2)
Lamp current	I _L	0	(7.0)	mA	(1) (2)
Lamp frequency	f _L	0	100	KHz	(1) (2)

4 Optical specification

4-1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast	CR	$\theta=0$ Normal viewing angle	360	450	—		(1)(2)	
Response time	Rising		T_R	—	(5)	TBD	msec	(1)(3)
	Falling		T_F	—	(20)	TBD		
White luminance (Center)	Y_L			340	400	—	cd/m ²	(1)(4) ($I_L=6.0\text{mA}$)
Color chromaticity (CIE1931)	White		W_x	0.263	0.313	0.363		(1)(4)
			W_y	0.279	0.329	0.379		
Viewing angle	Hor.	θ_L	50	60	—			
		θ_R	50	60	—			
	Ver.	θ_U	30	40	—			
		θ_D	50	60	—			
	Hor.	θ_L	60	(70)	—			
		θ_R	60	(70)	—			
	Ver.	θ_U	40	(50)	—			
		θ_D	60	(70)	—			
Brightness uniformity	B_{UNI}	$\theta=0$	70	—	—	%	(5)	

4-2 Measuring Condition

Measuring surrounding : dark room

Lamp current I_{FL} : $6.0 \pm 0.1\text{mA(rms)}$, Lamp freq $F_L=50\text{KHZ}$

Ambient temperature= 25 ± 2

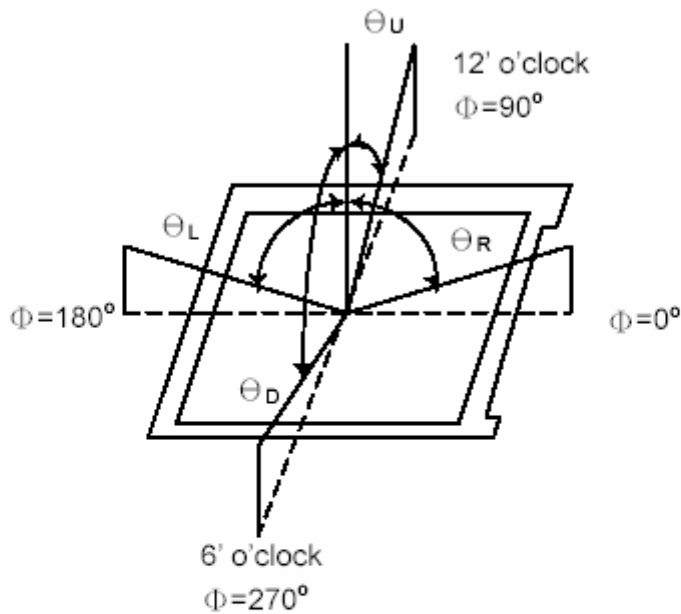
30min . warm-up time

4-3 Measuring Equipment

Otsuka Electrics Corp., which utilized MCPD-3000 for Chromaticity and BM-5 for other optical characteristics

Measuring spot size : 10 ~ 12 mm

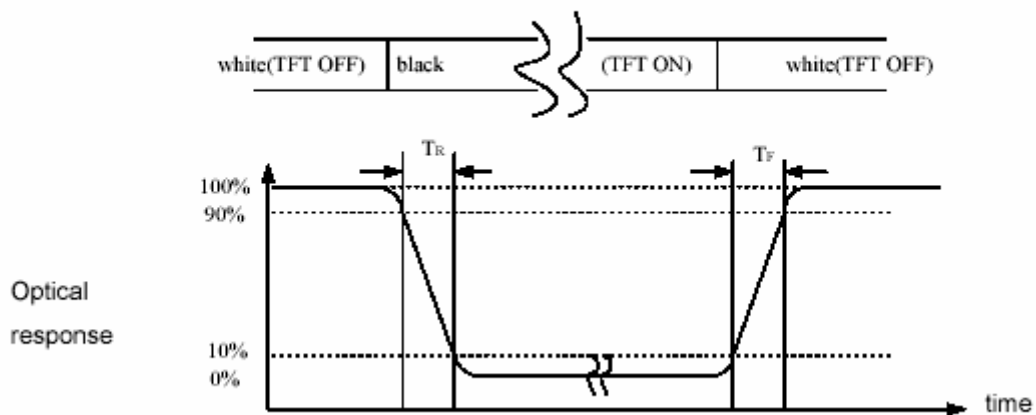
Note (1) Definition of Viewing Angle :



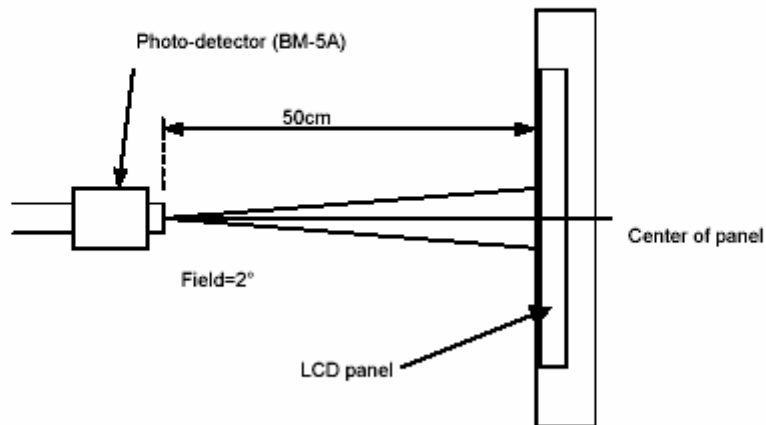
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

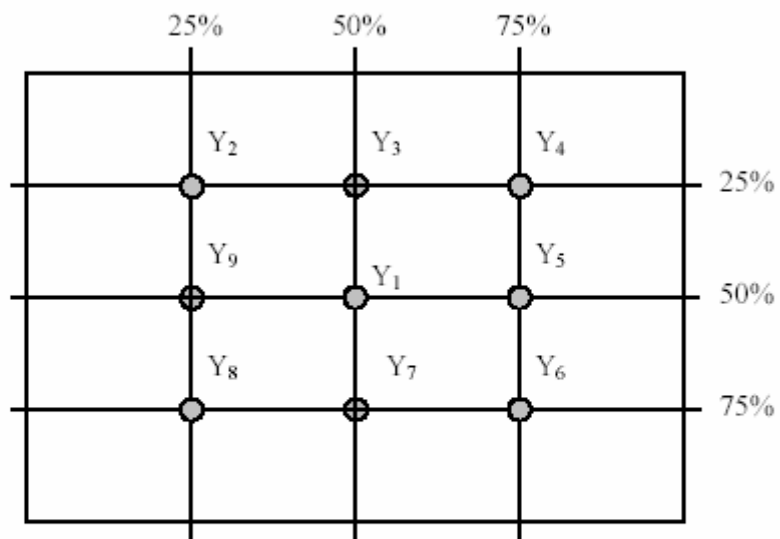
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of brightness uniformity

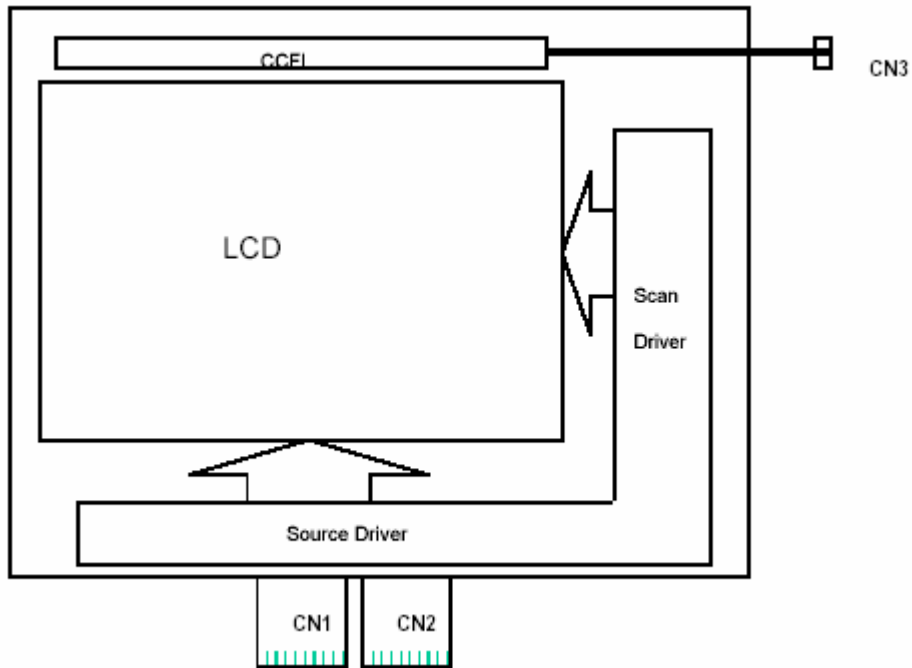


Note (5) Definition of brightness uniformity

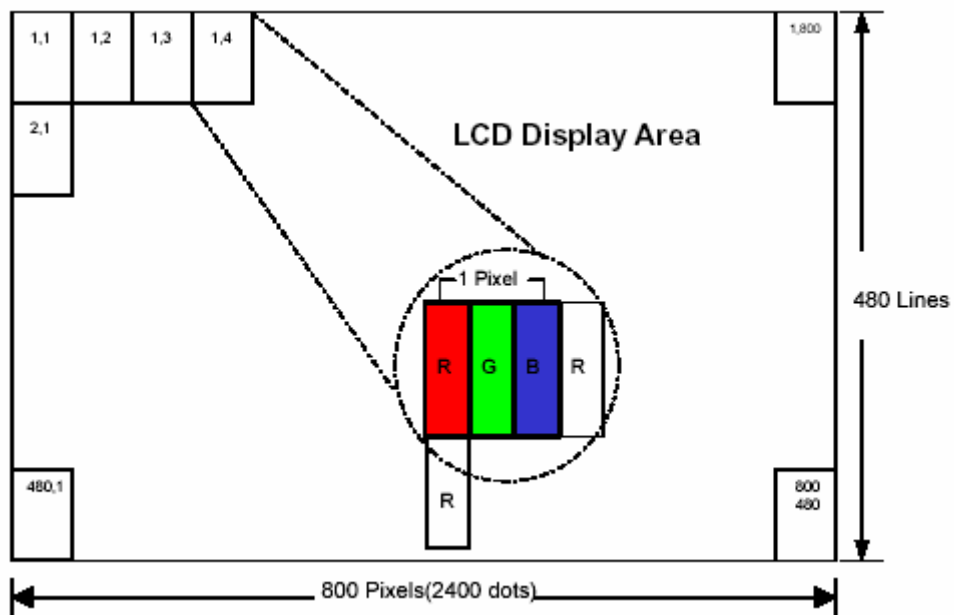


$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

5 Block diagram
5-1 TFT LCD MODULE



5-2 Pixel Format



6 ELECTRICAL CHARACTERISTICS

6-1 TFT LCD Module

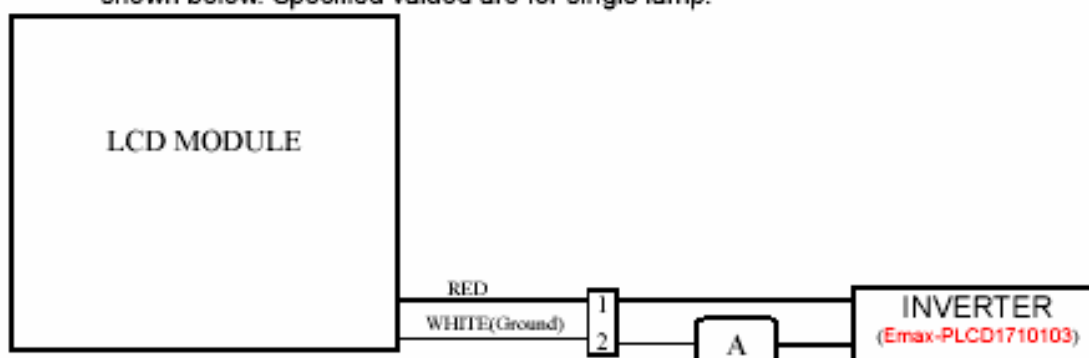
Parameter	Symbol	Min	Typ.	Max.	Unit
Supply Voltage	Dvcc	2.7	3.3	3.6	V
Low Level Input Voltage	Vil	0	-	0.3DVcc	V
High Level Input Voltage	Vih	0.7DVcc	-	DVcc	V
High Level Output Voltage	Voh	Dvcc-0.4	-	-	V
Low Level Output Voltage	Vol	Gnd	-	Gnd+0.4	V
Supply Voltage	AVCC	(6.5)	(8.4)	(10)	V
Sinking Current of Outputs	IOL	-80	-	-	uA
Driving Current of Outputs	IOH	80	-	-	uA

6-2 Back-Light Unit

The back-light system is an edge-lighting type with 1 CCFL . The characteristics of the lamp is shown in the following table.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	IL	3.0	6.0	7.0	mA(rms)	(1)(6)
Lamp voltage	VL	TBD	TBD	TBD	V(rms)	(6)IL=6.0mA
Frequency	fL	20	50	100	KHz	(2)
Operating lamp life time	Hr	10,000	-	-	Hour	(3)
Startup voltage	Vs	TBD	-	-	V(rms)	(4)(5)at 25°C
		TBD	-	-		(4)(5)at 0°C

Note (1) Lamp current is measured with current meter for high frequency as shown below. Specified valued are for single lamp.



Note (2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause ripple noise on the display. Therefore lamp frequency shall be kept away from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note (3) Lamp life time (Hr) can be defined as the time in which it continues to operate under the condition : Ta=25±3 °C, typical IL value indicated in the above table and fL=50kHz until the brightness becomes less than 50%.

Note (4) CCFL inverter should be able to provide a voltage over specified value (Vs) in the above table. Lamp units need at least Vs value shown above to ignition.

7 Interface specifications

7.1 TFT-LCD Module

CN1 & CN2(Input signal):FPC Down Connector , 30pins,pitch:0.5mm

CN1:

Terminal no.	Symbol	I/O	Function	Note
1	POL	I	Polarity Setting	(1)
2	STVR (DIO2)	I/O	Vertical Line start pulse I/O signal	
3	OEV	O	Vertical Line output Enable signal	
4	CPV	I	Vertical Line Clock	
5	STVL (DIO1)	I/O	Vertical Line start pulse I/O signal	
6	GND	-	Power Ground	
7	EDGSEL	I	Rising/Falling Selection	
8	DVCC	-	Digital Voltage Input	
9	VGMA_12	I	Gamma Voltage Input	
10	VGL	-	GateOFF Voltage	
11	VGMA_14	I	Gamma Voltage Input	
12	VGH	-	GateON Voltage	
13	VGMA_13	I	Gamma Voltage Input	(2)
14	U/D SEL	I	Vertical Scanning Line Direction Selection	(1)
15	VCOM1	-	Common Voltage	
16	GND	-	Power Ground	(1)
17	AVCC	-	Analog Voltage Input	
18	VGMA_10	I	Gamma Voltage Input	
19	VGMA_8	I	Gamma Voltage Input	
20	VGMA_6	I	Gamma Voltage Input	
21	VGMA_4	I	Gamma Voltage Input	(2)
22	VGMA_2	I	Gamma Voltage Input	
23	GND	-	Power Ground	
24	R5	I	Red Data Bus Input (MSB)	
25	R4	I	Red Data Bus Input	
26	R3	I	Red Data Bus Input	(2)
27	R2	I	Red Data Bus Input	(2)
28	R1	I	Red Data Bus Input	(1)
29	R0	I	Red Data Bus Input (LSB)	
30	GND	-	Power Ground	

CN2 :

Terminal no.	Symbol	I/O	Function	Note
31	GND	-	Power Ground	(1)
32	G5	I	Green Data Bus Input (MSB)	
33	G4	I	Green Data Bus Input	
34	G3	I	Green Data Bus Input	
35	G2	I	Green Data Bus Input	
36	G1	I	Green Data Bus Input	
37	G0	I	Green Data Bus Input (LSB)	
38	STHL	I/O	Horizontal Line start pulse I/O signal	
39	INV	I	Data Invert signal	
40	GND	-	Power Ground	
41	DCLK	I	Pixel clock	
42	DVCC	-	Digital Voltage Input	
43	STHR	I	Horizontal Line start pulse I/O signal	(2)
44	LOAD	O	Polarity latch and reflash new data to output	(1)
45	B5	I	Blue Data Bus Input (MSB)	
46	B4	I	Blue Data Bus Input	(1)
47	B3	I	Blue Data Bus Input	
48	B2	I	Blue Data Bus Input	
49	B1	I	Blue Data Bus Input	
50	B0	I	Blue Data Bus Input (LSB)	
51	R/L SEL	-	Horizontal Scanning Line direction Selection	(2)
52	VGMA_1	I	Gamma Voltage Input	
53	VGMA_3	I	Gamma Voltage Input	
54	VGMA_5	I	Gamma Voltage Input	
55	VGMA_7	I	Gamma Voltage Input	
56	VGMA_9	I	Gamma Voltage Input	(2)
57	VGMA_11	I	Gamma Voltage Input	(2)
58	AVCC	-	Analog Voltage Input	(1)
59	GND	-	Power Ground	
60	VCOM1	-	Common Voltage	

7.2 Back-Light Unit :

CN3 CCFL Power Source (BHSR-02VS-1) /JAPAN SOLDERLESS

TERMINAL MFG CO.,LTD

Mating Connector :(SBHT-002T-P0.5)/ JAPAN SOLDERLESS TERMINAL

MFG CO.,LTD

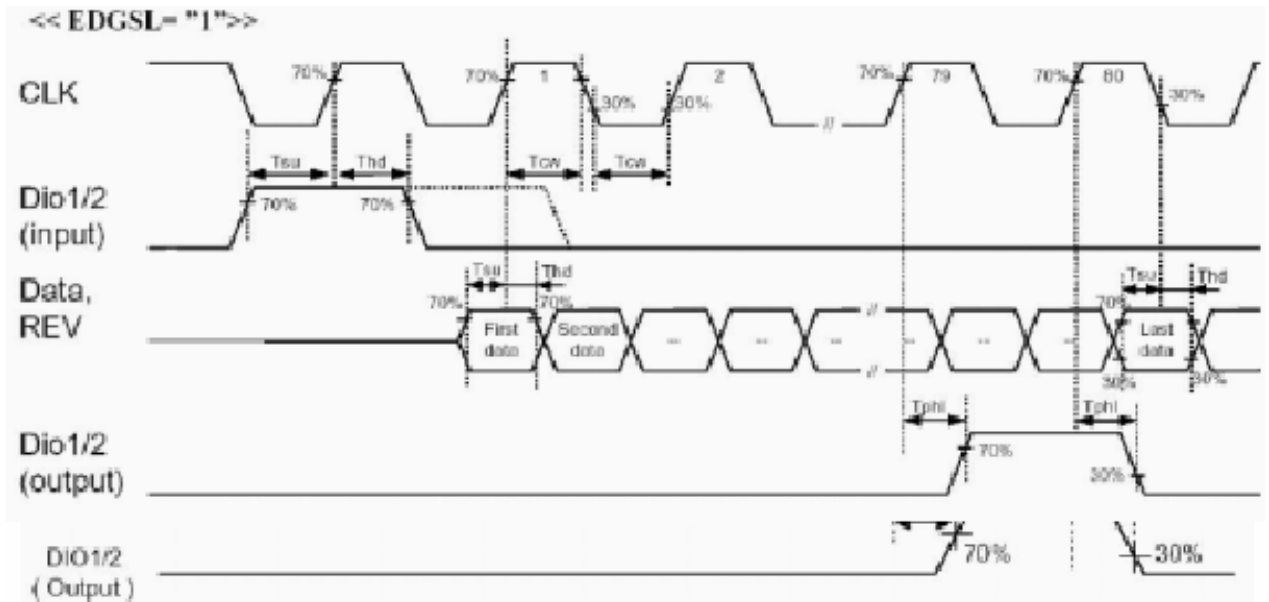
Terminal no.	Symbol	Function
1	VL	CCFL power supply (high voltage)
2	GL	CCFL power supply (low voltage)

7-3 AC characteristics

Parameter	Symbol	Min	Typ	Max	Unit
CLK frequency	Fclk	-	40	45	MHz
CLK pulse width	Tcw	6	-	-	ns
Data set up time	Tsu	4	-	-	ns
Data hold time	Thd	2	-	-	ns
Propagation delay of DIO2/1	Tphl	6	10	15	ns
Time that the last data to LD	Tld	1	-	-	Tcph
Pulse width of LD	Twid	2	-	-	Tcph
Time that LD to DIO1/2	Tlds	5	-	-	Tcph
POL set up time	Tpsu	6	-	-	ns
POL hold time	Tphd	6	-	-	ns
Output stable time	Tst	-	-	12	us
CKV pulse width	TCKV	5			us
OEV pulse width	TOEV	1			us
/XAO pulse width	twXAO	10			us
STV set up time	Tsuv	700			ns
STV hold time	Thdv	700			ns

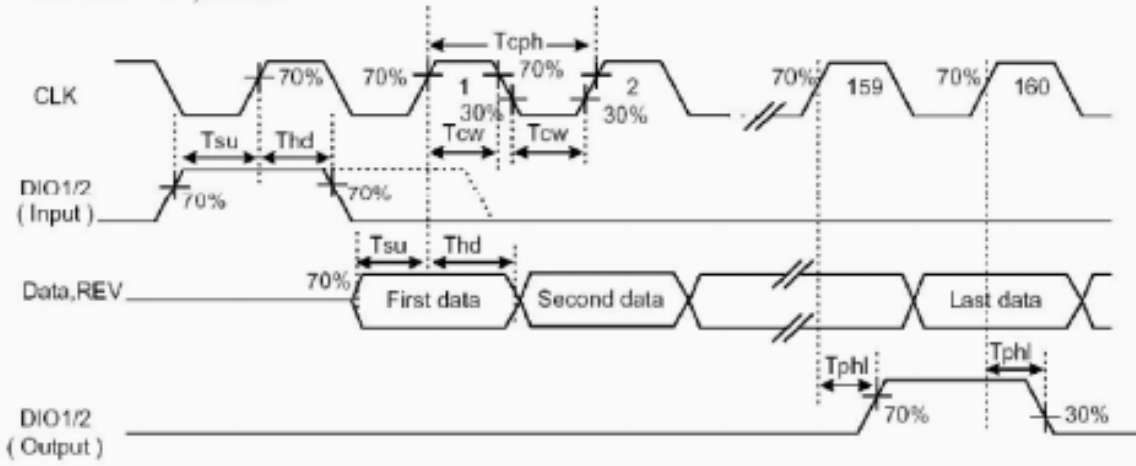
(DVcc=3.3V, Avcc=8.4V, Gnd=0V, Ta=25°C)

7-4 Timing Diagram of Interface Signal



Operation Model

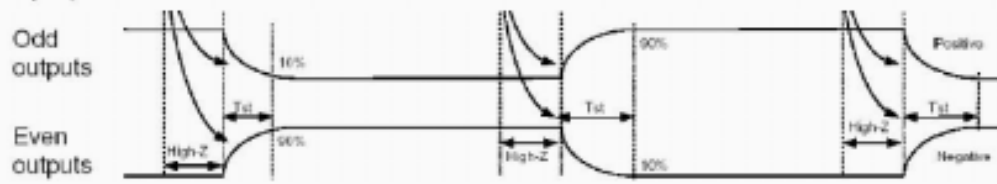
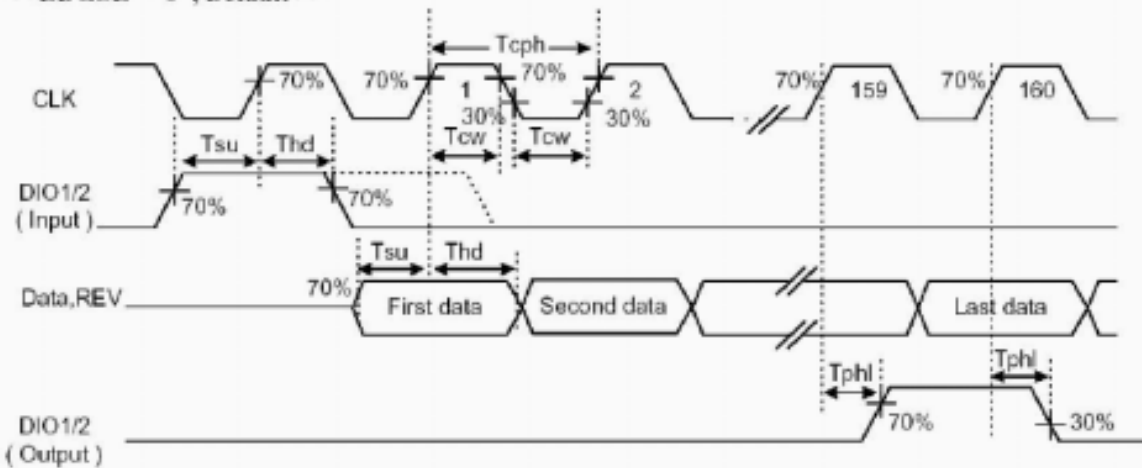
<< EDGSL= "0", Default >>



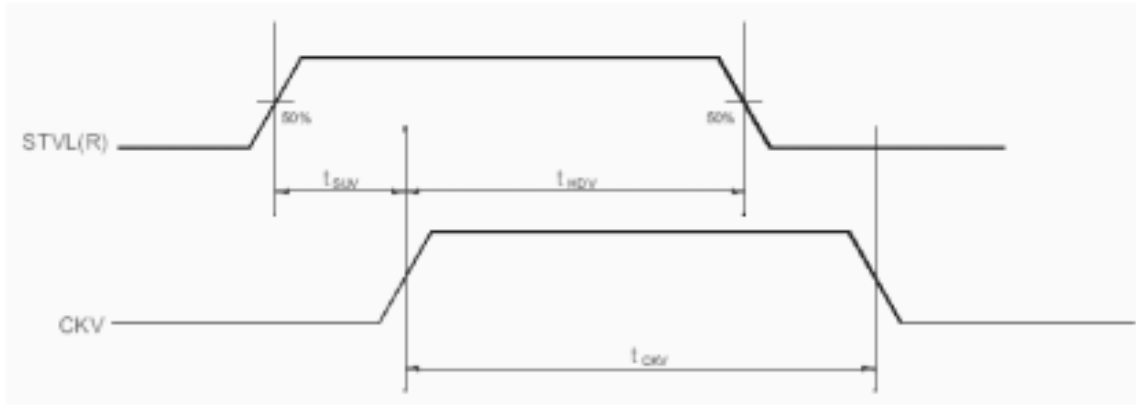
Operation Mode2

■ Timing Diagram 2

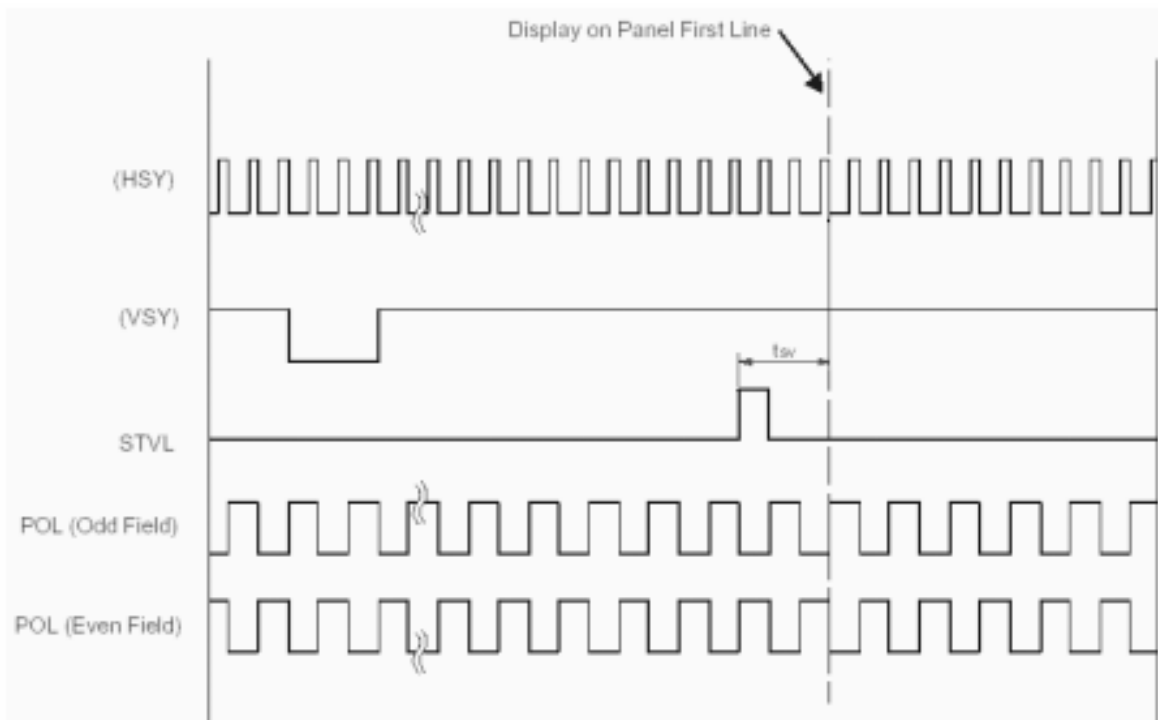
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Horizontal timing

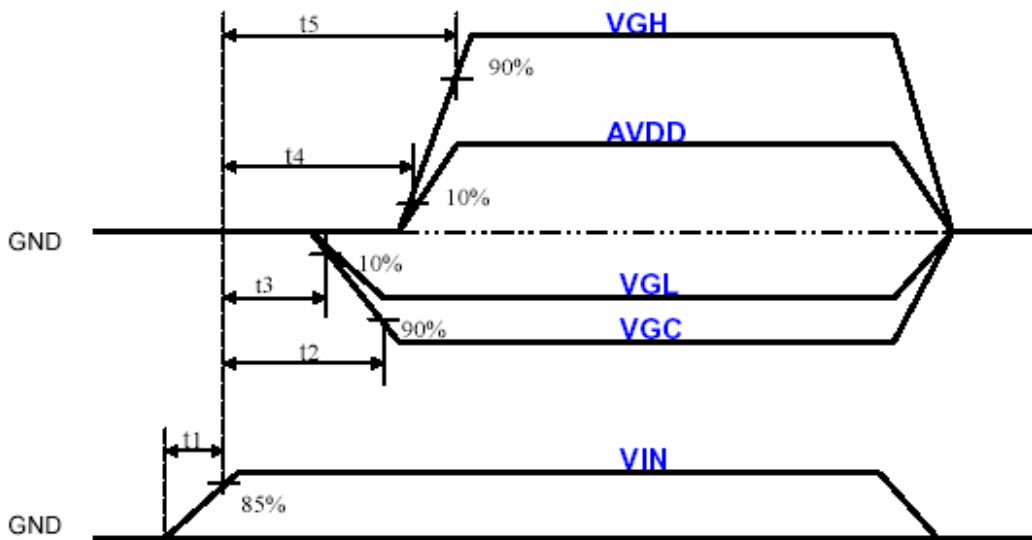


Vertical shift clock timing



Vertical shift clock timing (from up to down)

7-5 Power Sequence



Power Sequence

Power Sequence: VIN -> VGL->VGC -> AVDD -> VGH

$t1 < 10\text{ms}$

$t3 < t4$

$t2, t5 \leq 40\text{ms}$.

Note Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

8 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70°C, 240hrs	
2	Low Temperature Storage	Ta=-20°C, 240hrs	
3	High Temperature Operation	Ta=+60°C, 240hrs	
4	Low Temperature Operation	Ta=-10°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-20°C(30min)→ +70°C(30min), 200cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/each terminal	
8	Vibration	Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz Cycle: 15 minutes 2 hours for each direction of X,Z 4 hours for Y direction	JIS C7021, A-10 (Condition A)
9	Shock	100G,6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random vibration: 0.015G ² /Hz from 5~200Hz -6dB/octave from 200~500Hz	IEC 68-34
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

Note: There are no display function NG issue occurred, All the cosmetic specification is judged before the reliability stress.

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. $1M\Omega$ 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.

9.4 Operating precautions

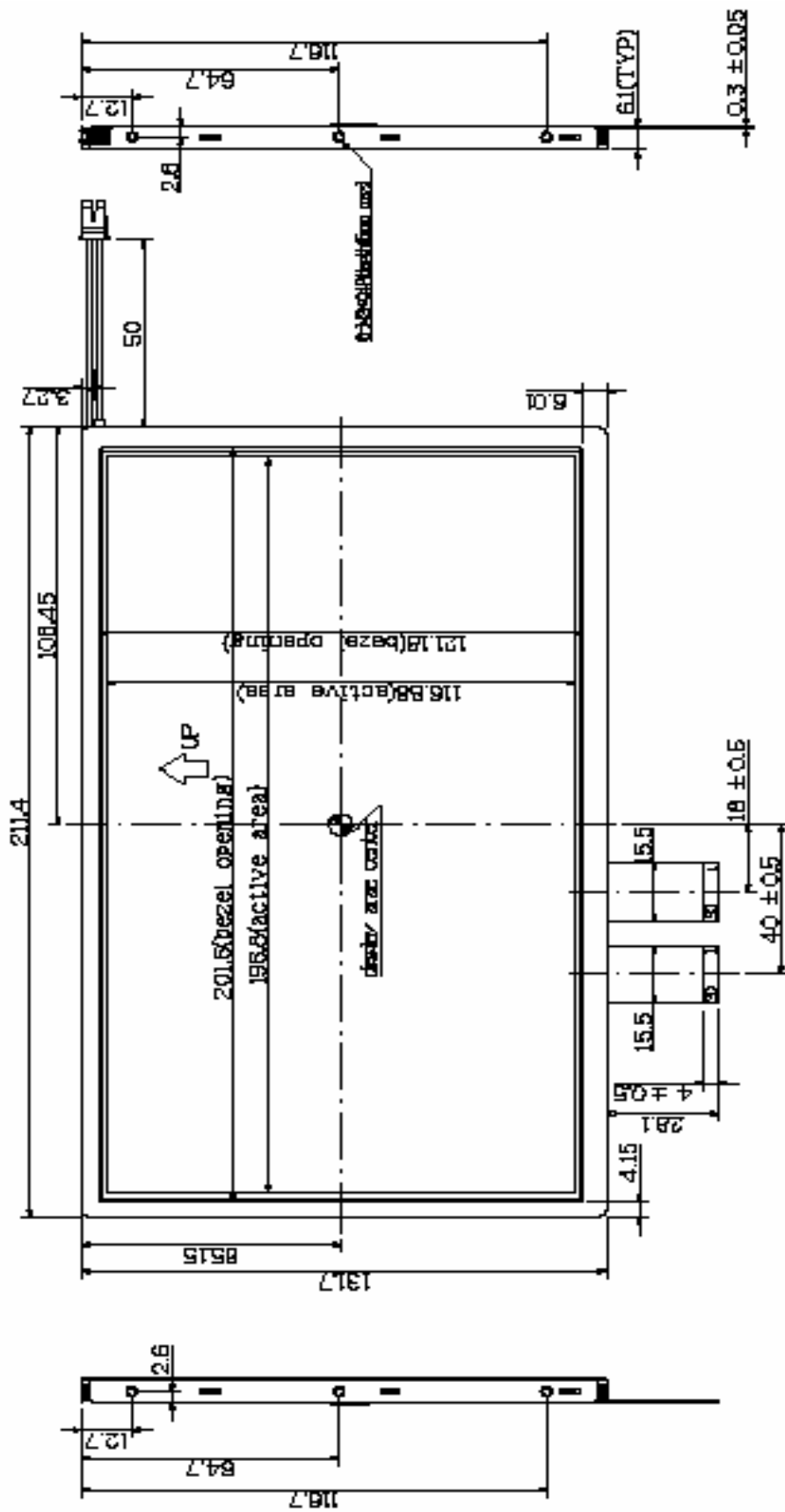
- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input 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.

10 OUTLINE DIMENSION

10-1 Front view



10-2 Back view

