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.	AM-1024768DTMCW-00
APPROVED BY	
DATE	

☐ Approved For Specifications
☐ Approved For Specifications & Sample

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RECORD OF REVISION

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1. Features

AM-1024768D 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 12.1 inch diagonally measured active area with XGA resolutions (1024 horizontal by 768 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 262,144 colors. The TFT-LCD panel used for this module is a low reflection and higher color type.

(1) Thin and light weight
(2) 3.3 V power supply
(3) Low driving voltage and low power consumption
(4) 1 Channel LVDS Interface
(5) Single CCFL (Bottom side/Horizontal Direction)
(6) 262,144 colors
(7) Data enable signal mode
(8) Side Mounting Frame
(9) SUS Bezel
(10) RoHS compliant.

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit	Note
Active area	245.76 (H) ×184.32 (V)	mm	
Number of pixels	1024(H) × 768(V)	pixels	
Pixel pitch	0.240(H) × 0.240(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	262,144	colors	
Display mode	Normally White		
Dimensional outline	261.0 (W) ×199.0 (V) ×5.15(D)Max	mm	
Weight	280 (Typ.) / 285 (Max.)	gram	
Back-light	1-CCFL, Horizontal bottom edge type		(1)

Note : 1. CCFL (Cold Cathode Fluorescent Lamp)

3. ABSOLUTE MAX. RATINGS

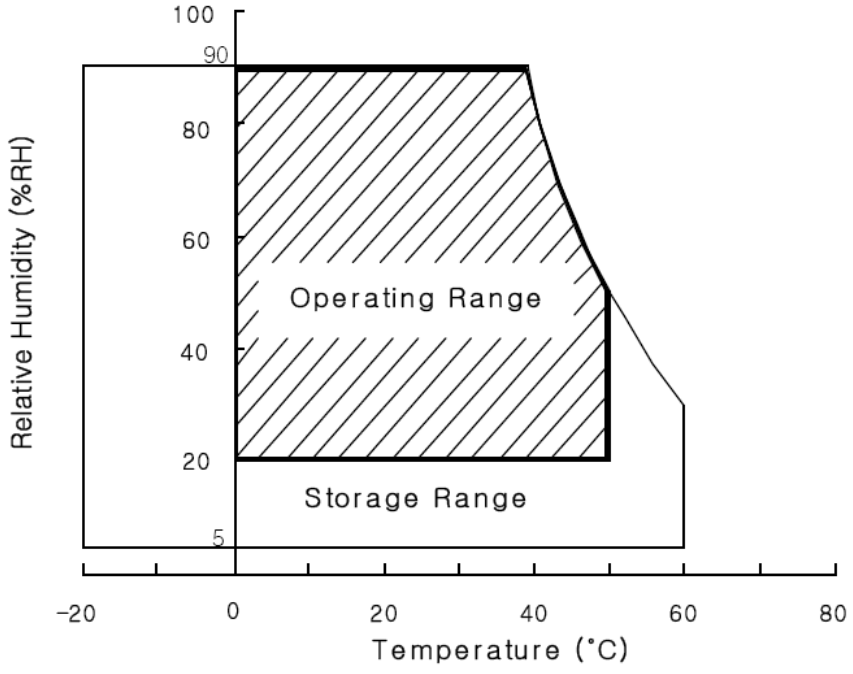
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
Logic Power Supply	VDD	VSS-0.3	4.0	V	Ta = 25 ±2 ℃
Logic Input Voltage	VIN	VSS-0.3	VDD+0.3	V	
Back-light Lamp Current	IBL	2.0	7.0	mA	
Back-light Frequency	FBL	45	80	KHz	
Operating Temperature	TOP	0	+50	℃	(1)
Storage Temperature	TSP	-20	+60	℃	

Note1. Temperature and relative humidity range are shown in the figure below.

* 90 [%] RH Max. (40℃ ≥Ta)

* Maximum wet-bulb temperature at 39 ℃ or less. (Ta＞40℃) No condensation



4. ELECTRICAL CHARACTERISTICS

4-1 Typical Operation Conditions

Item	Symbol	Values			Unit	Note
		MIN	TYP	MAX		
Power Supply Voltage	VDD	3.0	3.3	3.6	V	(1)
Power Supply Current	IDD	--	300	500	mA	(1)
CCFL Ignition Time	t	--	--	1	sec	
High Level Differential Input Signal Voltage	VIH	--	--	+100	mV	
Low Level Differential Input Signal Voltage	VIL	-100	--	--	mV	
Back-light Lamp Voltage	VBL	690	570	565	Vrms	(2)
Back-light PWM Frequency	FPWM	200	320	350	Hz	
Back-light Lamp Current	IBL	2.0	6.0	6.5	mA	
Back-light Lamp operating Frequency	FL	45	--	80	KHz	One Lamp, (3)
Lamp Start Voltage		1,080	--	--	Vrms	At Ta=25℃, (4)
		1,350	--	--	Vrms	At Ta=0℃, (4)
Lamp Life		12,000	15,000	--	Hrs	IBL= 6mA, (5)
Power Consumption	PD	--	1.0	1.65	W	(1)
	PBL	--	3.42	3.68	W	IBL=6mA, (6)
	Ptotal	--	4.42	5.33	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for 3.3V @ 50Hz.

a) Typ: Windows XP desktop Pattern b) Max: V2 Skip Pattern (L128)

2. Reference value, which is measured with Samsung Electric SIC-180 Inverter. (VBL Min is value at IBL Min and VBL Max is value at IBL Max)
3. The lamp frequency should be selected as different as possible from the horizontal synchronous frequency and its harmonics to avoid interference which may cause line flow on the display.

4. For starting the backlight unit, the output voltage of DC/AC's transformer should be larger than the minimum lamp starting voltage.(1,080 Vrms at 25℃ & 1,350 Vrms at 0 ℃)
   If an inverter has shutdown function it should keep its output for more than 1 second even if the lamp connector open. Otherwise the lamps may not to be turned on.
5. End of Life shall be determined by the time when any of the following is satisfied under continuous lighting at 25℃ and IBL = 6.0[mA].
   a) Intensity drops to 50% of the Initial Value.
6. Calculated value for reference (VBL × IBL)

5. Optical Specifications

5-1 Overview

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 TOPCONE 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 θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θØ=90 (= θ12) as the 12 o'clock direction ("upward"), θØ=180 (= θ9) as the 9 o'clock direction ("left") and θØ=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement... VDD shall be 3.3+/- 0.3V at 25°C. Optimum viewing angle direction is 6 o'clock.

5-2 Optical Specifications

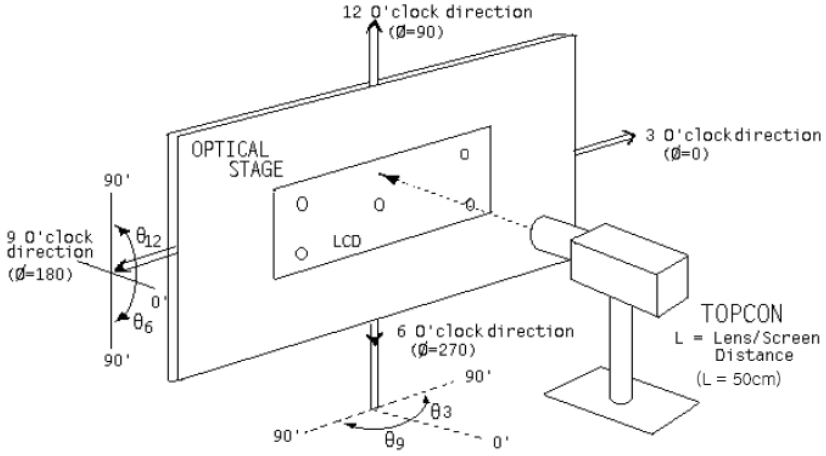
Item		Symbol	Condition	Values			Unit	Note
				Min.	Typ.	Max.		
Viewing Angle Range	Horizontal	Θ3	CR > 10		45	--	Deg.	(1)
		Θ 9			45	--		
	Vertical	Θ12			15	--		
		Θ6			30	--		
Luminance Contrast ratio		CR	Θ = 0°	--	200	--		(2)
Luminance of White	1 Point Center	Yw	Θ = 0° IBL = 6mA	--	220	--	cd/m	(3)
White Luminance Uniformity	5 Points	ΔY5		80	85	--	%	(4)
	13 Points	ΔY13		65	75	--		
White Chromaticity		Xw	Θ = 0°	0.288	0.318	0.348		(5)
		Yw		0.302	0.332	0.362		
Reproduction of color	Red	X_R	Θ = 0°	0.551	0.581	0.611		
		Y_R		0.307	0.337	0.367		
	Green	X_G		0.279	0.309	0.339		
		Y_G		0.514	0.544	0.574		
	Blue	X_B		0.120	0.150	0.180		
		Y_B		0.113	0.143	0.173		
Response Time	Rise	Tr	Ta= 25℃ Θ = 0°	--	10	20	ms	(6)
	Decay	Td		--	20	40	ms	
Cross Talk		CT	Θ = 0°	--	--	2.0	%	(7)

(Table 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

Figure 1. Measurement Set Up

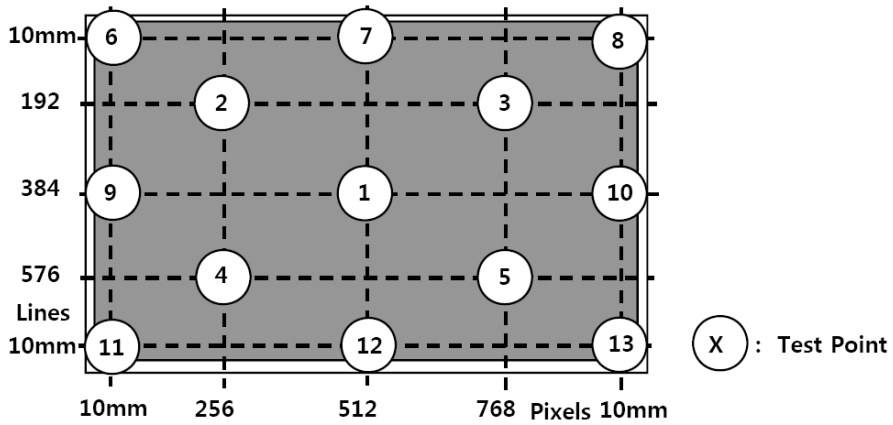


2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. Luminance Contrast Ratio (CR) is defined mathematically.

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

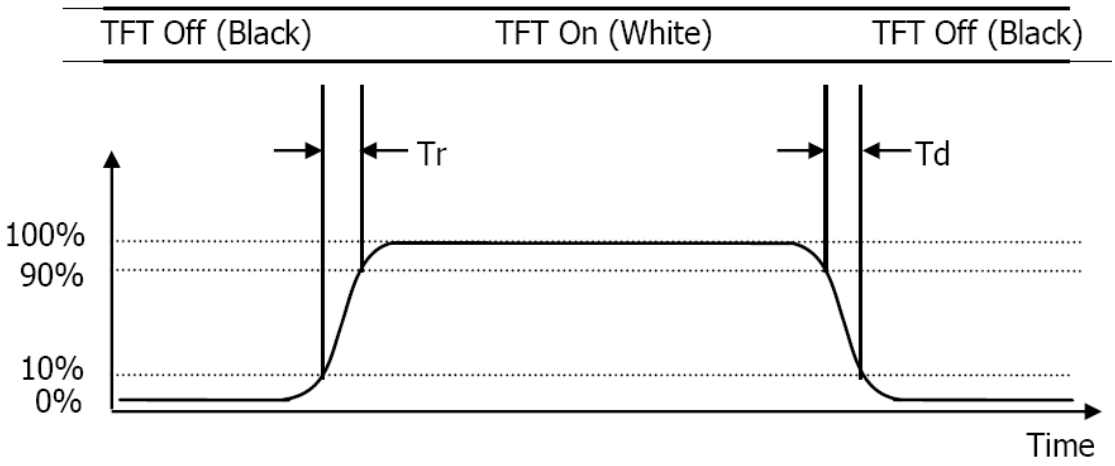
3. Center Luminance of white is defined as luminance values of center 1 point across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. And the typical luminance is measured at 6mA lamp current.

Figure 2. Average Luminance Measurement Locations & Uniformity Measurement Locations



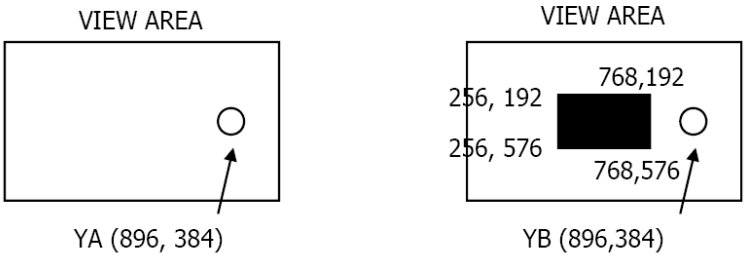
4. The White luminance uniformity on LCD surface is then expressed as : ΔY = Minimum Luminance of 5(or 13) points / Maximum Luminance of 5(or 13) points (see FIGURE 2 shown in Appendix).
5. The color chromaticity coordinates specified in Table 4 shall be calculated from 5. the spectral data measured 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 Tr, and 90% to 10% is Td.

Figure 3. Response Time Testing



7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark. (See FIGURE 4 shown in Appendix).

Figure 4. Cross Modulation Test Description



$$\text{Cross-Talk} = \left| \frac{YB - YA}{YA} \right| \times 100$$

Where:
Y_A = Initial luminance of measured area (cd/m²)
Y_B = Subsequent luminance of measured area (cd/m²)
The location measured will be exactly the same in both patterns.

6. INTERFACE

6.1 Electrical Interface Connection

CN1 : Interface Connector : Hirose/DF19KR-20P-1H or equivalent

User side Connector : Hirose/DF19G-20S-1C or equivalent

Pin No.	Symbol	Description	Note
1	VDD1	Power Supply: +3.3V	
2	VDD2	Power Supply: +3.3V	
3	VSS	Ground	
4	VSS	Ground	
5	RIN0-	LVDS Negative data signal (-)	Tx pin # 48
6	RIN0+	LVDS Positive data signal (+)	Tx pin # 47
7	VSS	Ground	
8	RIN1-	LVDS Negative data signal (-)	Tx pin # 46
9	RIN1+	LVDS Positive data signal (+)	Tx pin # 45
10	VSS	Ground	
11	RIN2-	LVDS Negative data signal (-)	Tx pin # 42
12	RIN2+	LVDS Positive data signal (+)	Tx pin # 41
13	VSS	Ground	
14	RCLKIN-	LVDS Negative clock signal (-)	Tx pin # 40
15	RCLKIN+	LVDS Positive clock signal (+)	Tx pin # 39
16	VSS	Ground	
17	NC	No Connection	
18	NC	No Connection	
19	NC	No Connection	
20	NC	No Connection	

6.2 Back-light interface

CN2 : Interface Connector : BHSR-02VS-1 (JST) or equivalent

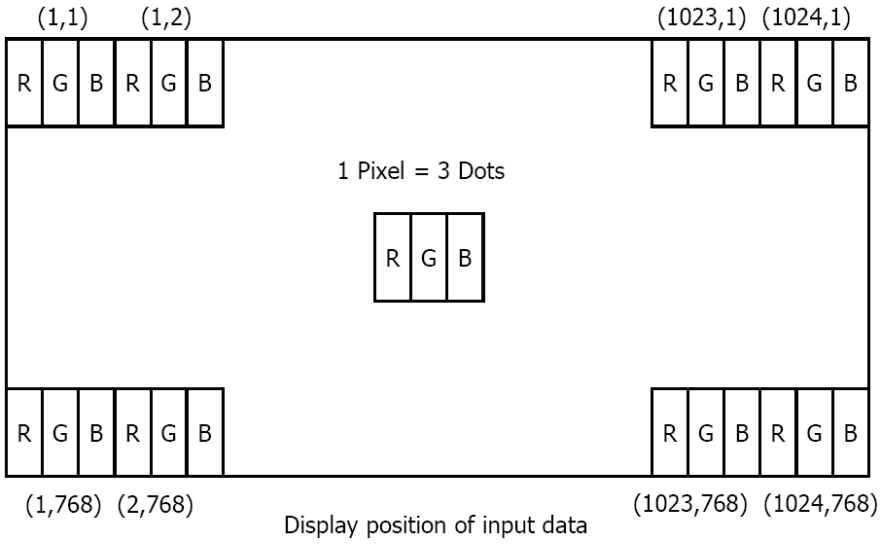
Pin No.	Input	Description	Note
1	HOT	High voltage	Pink
2	COLD	Ground	Black

6.3 LVDS Interface

LVDS Transmitter : THC63LVDM83A or equivalent.

Input Signal	Transmitter		Interface		DF19KR-20P-1H	Note
	Pin No.	Pin No.	System(TX)	TFT-LCD(RX)	Pin No.	
R0	51	48 47	OUT0- OUT0+	IN0- IN0+	5 6	
R1	52					
R2	54					
R3	55					
R4	56					
R5	3					
G0	4					
G1	6	46 45	OUT1- OUT1+	IN1- IN1+	8 9	
G2	7					
G3	11					
G4	12					
G5	14					
B0	15					
B1	19					
B2	20	42 41	OUT2- OUT2+	IN2- IN2+	11 12	
B3	22					
B4	23					
B5	24					
HSYNC	27					
VSYNC	28					
DE	30					
MCLK	31	40	CLKOUT-	CLKIN-	14	
		39	CLKOUT+	CLKIN+	15	

6.4 Data Input Format



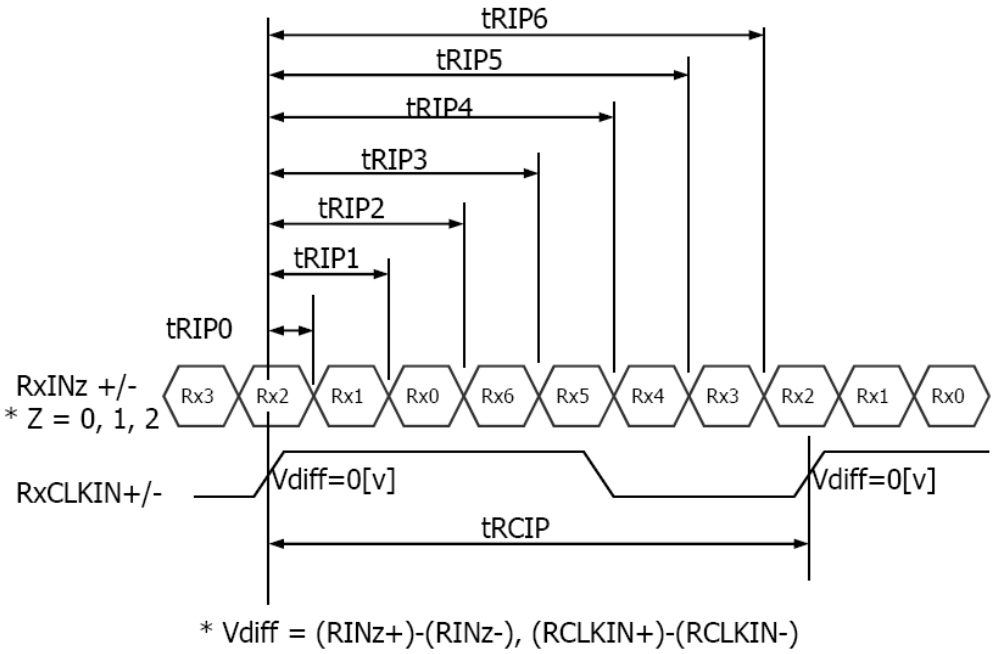
7. Signal Timing Specifications

7-1 The 12.1”XGA LCM is operated by the only DE mode (LVDS Transmitter Input)

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	-	65	80	MHz
	High Time	Tch	4.5	-	-	ns
	Low Time	Tcl	4.5	-	-	ns
Data	Setup Time	Tds	2.7	-	-	ns
	Hold Time	Tdh	0	-	-	ns
Data Enable Setup Time		Tes	2.7	-	-	ns
Frame Period		Tv	772	806	1022	lines
Vertical Display Period		Tvd	768	768	768	lines
One Line Scanning Period		Th	1100	1344	2046	clocks
Horizontal Display Period		Thd	1024	1024	1024	clocks

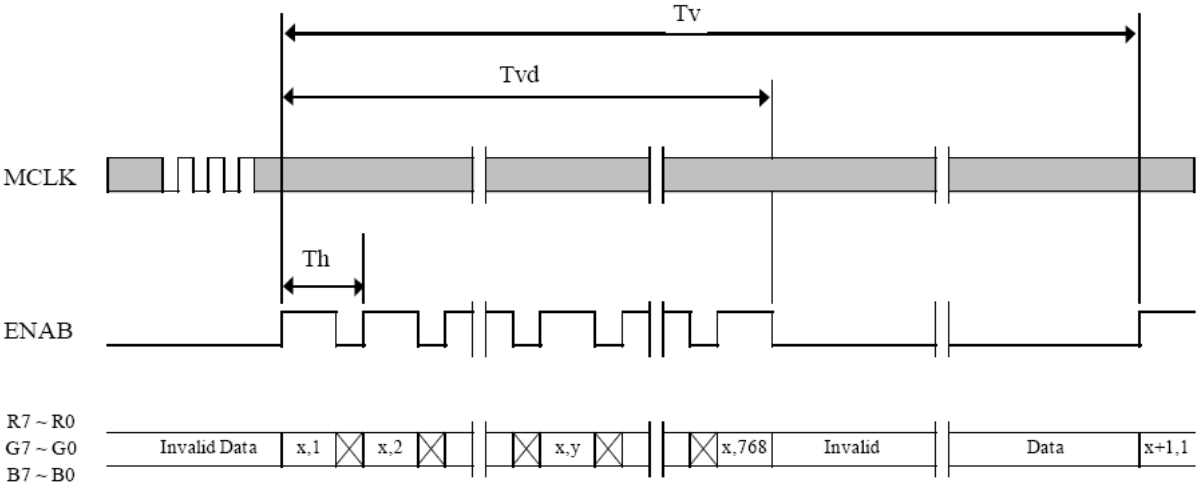
7-2 LVDS Rx Interface Timing Parameter

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	12.5	15.38		nsec	
Input Data 0	tRIP0	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP1	tRICP/7-0.4	tRICP/7	tRICP/7+0.4	nsec	
Input Data 2	tRIP2	2 ×tRICP/7-0.4	2 ×tRICP/7	2 ×tRICP/7+0.4	nsec	
Input Data 3	tRIP3	3 ×tRICP/7-0.4	3 ×tRICP/7	3 ×tRICP/7+0.4	nsec	
Input Data 4	tRIP4	4 ×tRICP/7-0.4	4 ×tRICP/7	4 ×tRICP/7+0.4	nsec	
Input Data 5	tRIP5	5 ×tRICP/7-0.4	5 ×tRICP/7	5 ×tRICP/7+0.4	nsec	
Input Data 6	tRIP6	6 ×tRICP/7-0.4	6 ×tRICP/7	6 ×tRICP/7+0.4	nsec	

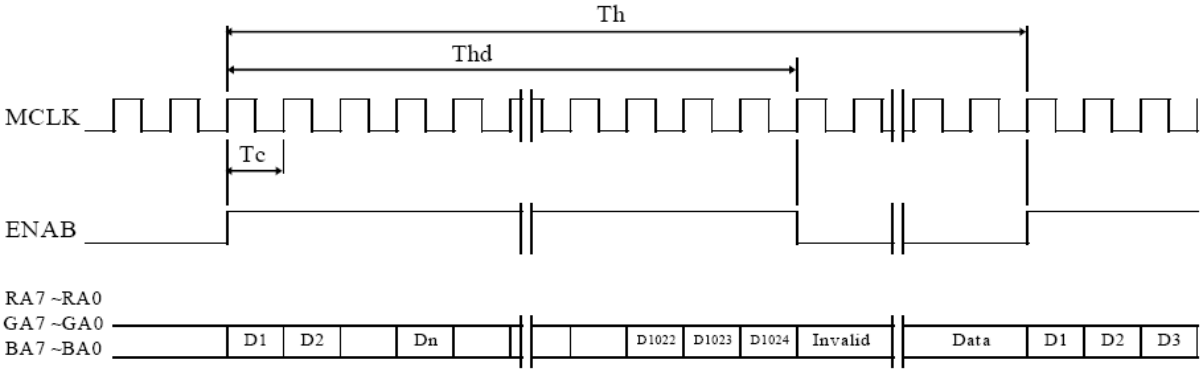


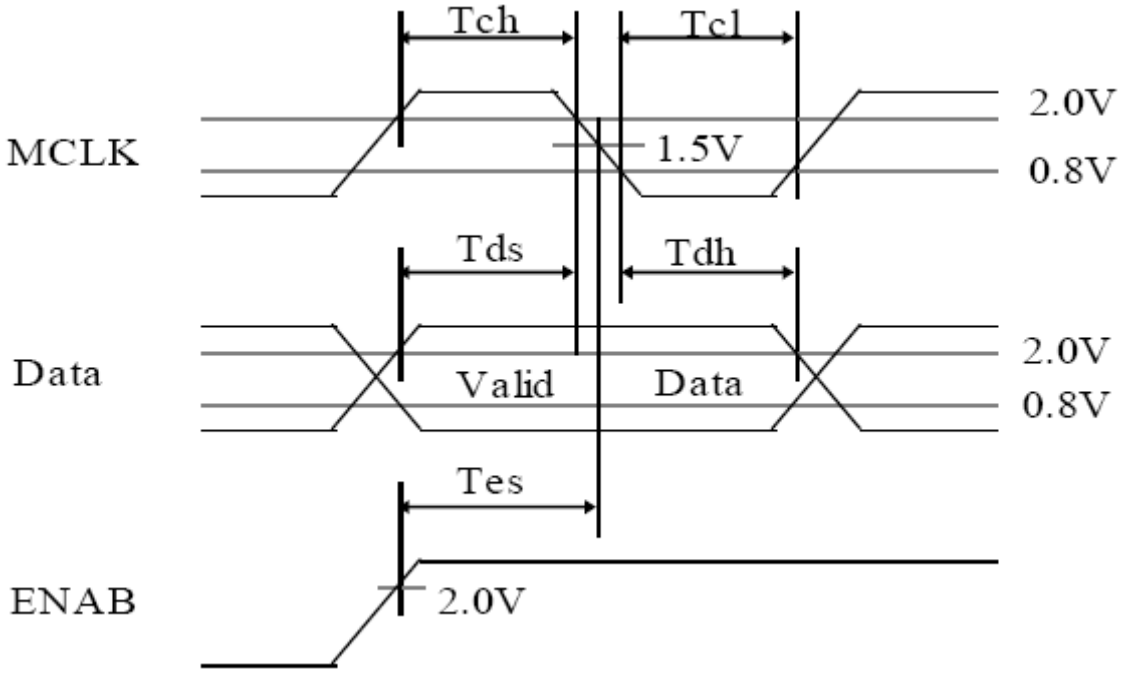
8. Signal Timing Waveforms Of Interface Signal (DE Mode)

8.1 Vertical Timing Waveforms



8.1 Horizontal Timing Waveforms



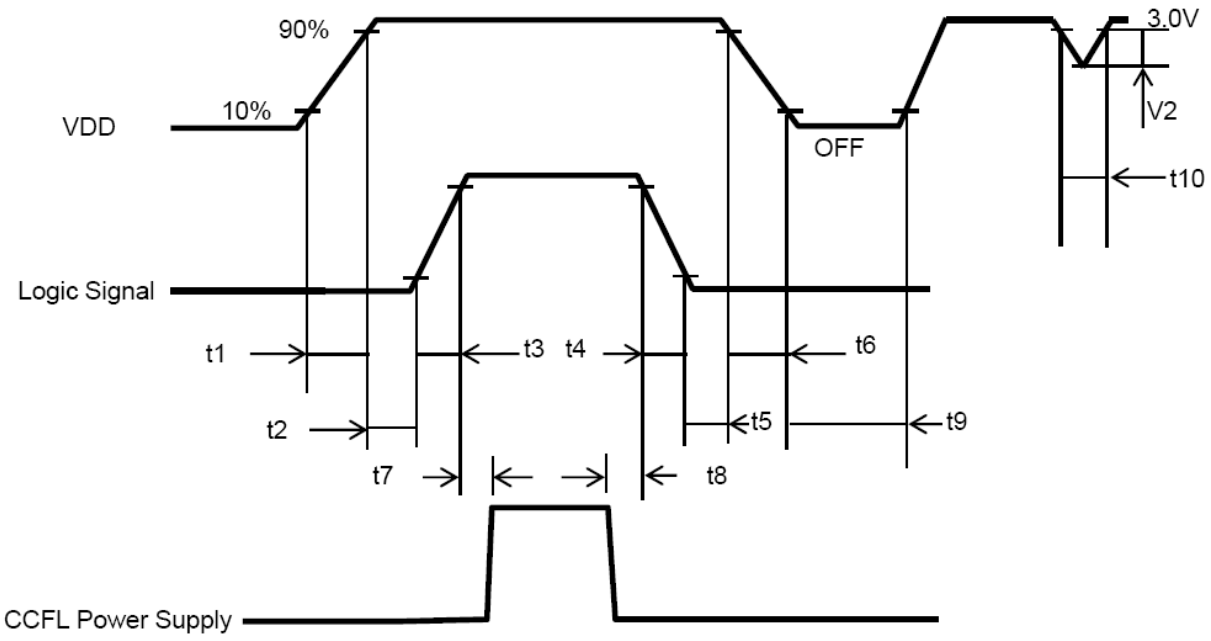


9. Input Signals, Basic Display Coors & Gray Scale Of Colors

Colors & Gray Scale		Red Data						Green Data						Blue Data					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	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
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	1	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	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	1	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	▽	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	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	1
	Darker	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	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Gray Scale Of White & Black	Black	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	1	0	0	0	0	0	1
	Darker	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0
	△	↓						↓						↓					
	▽	↓						↓						↓					
	Brighter	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1
	▽	1	1	1	1	1	0	1	1	1	1	1	0	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

10. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



$0 < t1 \leq 10$ ms	$0 \leq t4 \leq 50$ ms
$0 < t2 \leq 50$ ms	$0 < t5 \leq 50$ ms
$0 \leq t3 \leq 50$ ms	$t6 \leq 10$ ms
$t7 \geq 100$ ms	$t8 \geq 100$ ms
$t9 \geq 200$ms	$t10 \leq 10$ ms

$$2.8\ V \leq V2 \leq 3.0V$$

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.
3. Back Light must be turn on after power for logic and interface signal are valid.

11. RELIABILITY TEST CONDITIONS

Item	Test Conditions	Note
High temperature storage test	Ta = 60 °C, 240 hrs	
Low temperature storage test	Ta = -20 °C, 240 hrs	
High temperature & high humidity operation test	Ta = 50 ℃, 80%RH, 240hrs	
High temperature operation test	Ta = 50 °C, 240 hrs	
Low temperature operation test	Ta = 0 °C, 240 hrs	
Thermal shock	Ta = -20 °C ~ 60 °C (0.5H), 100 cycle	
Vibration test (non-operating)	Frequency : 10~300Hz Gravity/AMP : 1.5G Period : X,Y,Z 30min	
Shock test (non-operating)	Gravity : 210G Pulse width : 3ms, half sine wave ±X, ±Y, ±Z Once for each direction	
Electro-Static Discharge Test (non-operating)	Air : 150pF 330ohm 15KV Contact : 150pF, 330ohm, 8KV	

12. HANDLING & CAUTIONS

12.1 Cautions when taking out the module

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

12.2 Cautions for handling the module

12.2.1 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.

12.2.2 As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.

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

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

12.2.5 Put the module display side down on a flat horizontal plane.

12.2.6 Handle connectors and cables with care.

12.3 Cautions for the operation

12.3.1 When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.

12.3.2 Obey the supply voltage sequence. If wrong sequence were applied, the module would be damaged.

12.4 Cautions for the atmosphere

12.4.1 Dewdrop atmosphere should be avoided.

12.4.2 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.

12.5 Cautions for the module characteristics

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

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

12.6 Other cautions

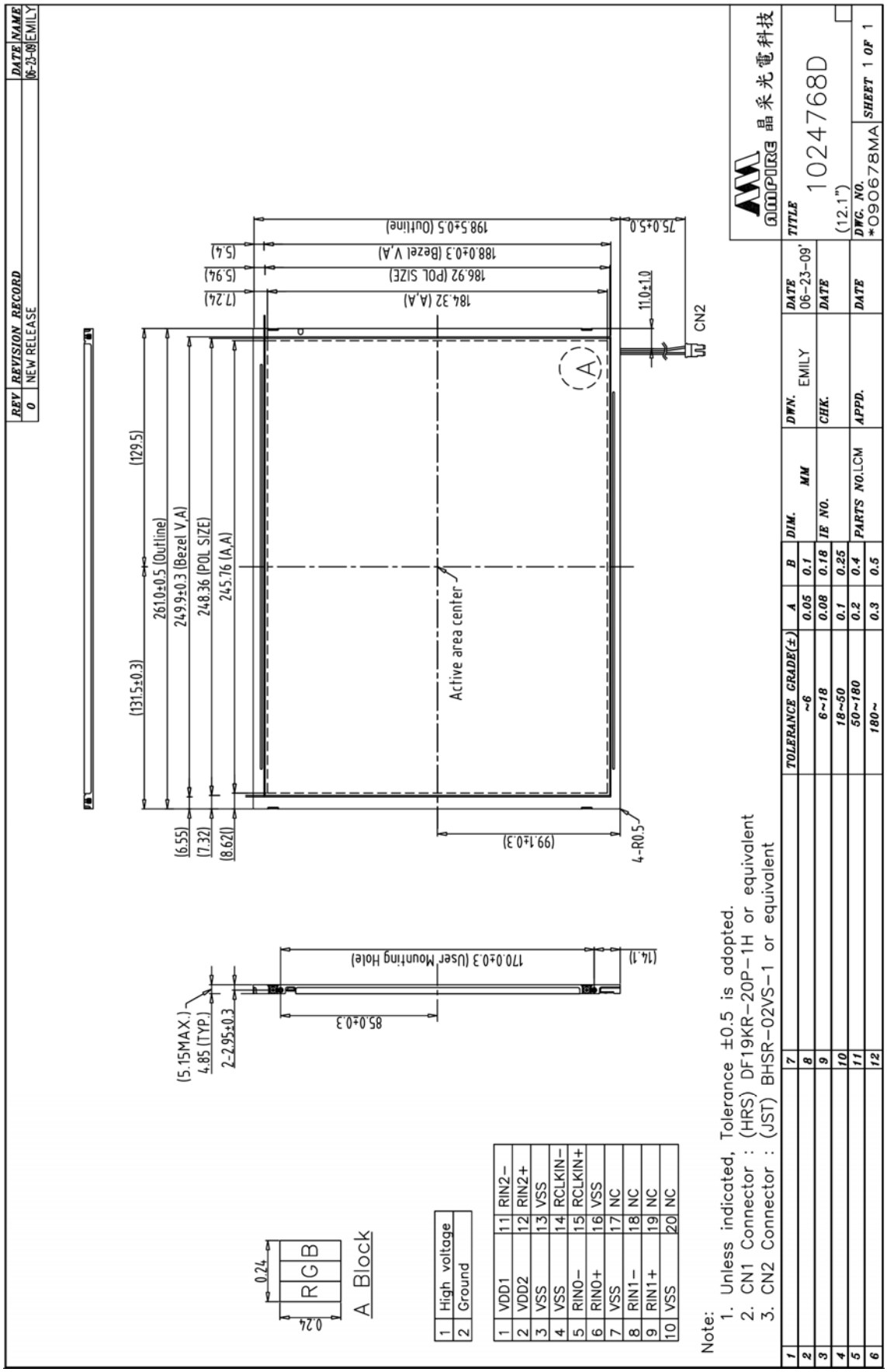
12.6.1 Do not disassemble and/or re-assemble LCD module.

12.6.2 Do not re-adjust variable resistor or switch etc.

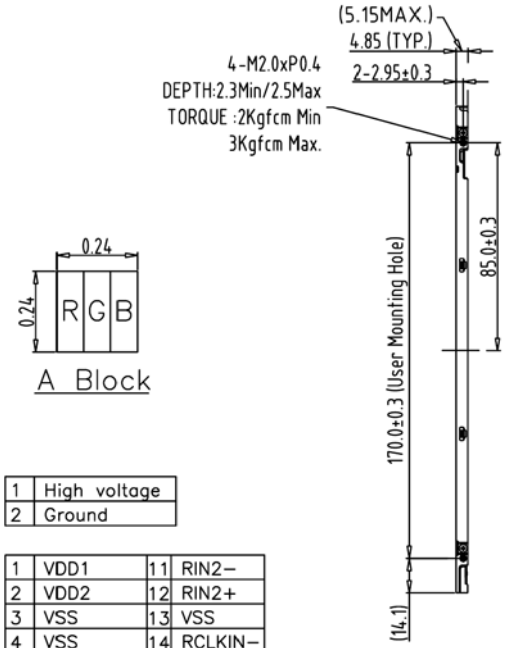
12.6.3 When returning the module for repair or etc, please pack the module not to be broken. We recommend using the original shipping packages.

12.6.4 AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

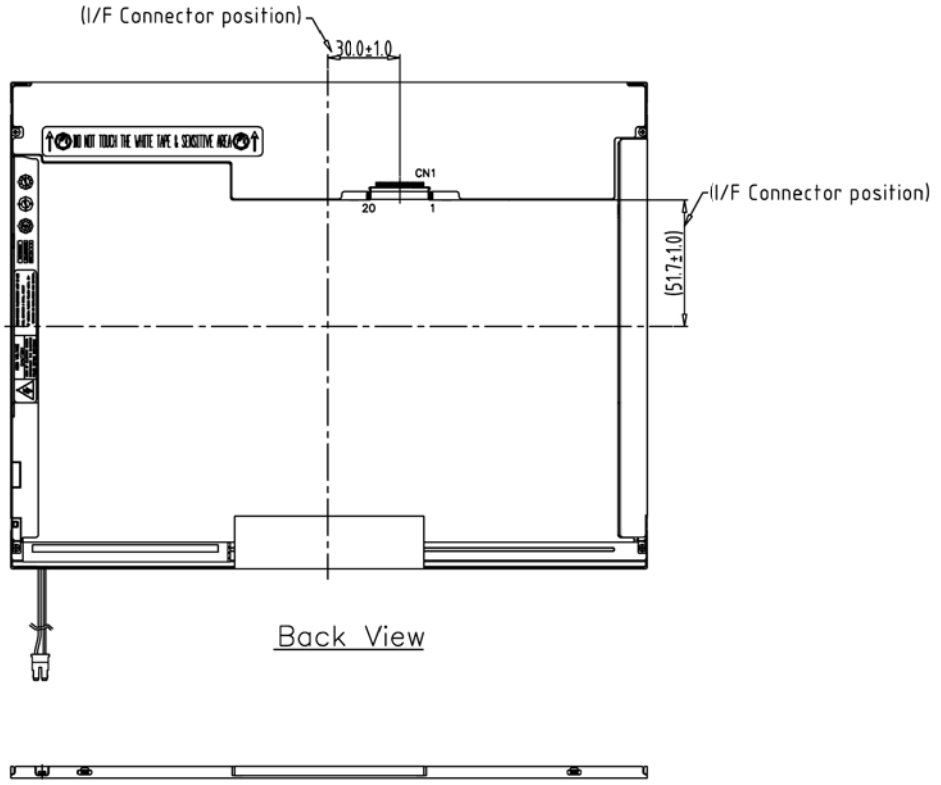
13. OUTLINE DIMENSION



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	06-23-09	EMILY



A Block



Back View

1	High voltage
2	Ground

1	VDD1	11	RIN2−
2	VDD2	12	RIN2+
3	VSS	13	VSS
4	VSS	14	RCLKIN−
5	RIN0−	15	RCLKIN+
6	RIN0+	16	VSS
7	VSS	17	NC
8	RIN1−	18	NC
9	RIN1+	19	NC
10	VSS	20	NC

Note:
1. Unless indicated, Tolerance ±0.5 is adopted.
2. CN1 Connector : (HRS) DF19KR−20P−1H or equivalent
3. CN2 Connector : (JST) BHSR−02VS−1 or equivalent

				TOLERANCE GRADE(±)	A	B
1		7				
2		8		~6	0.05	0.1
3		9		6~18	0.08	0.18
4		10		18~50	0.1	0.25
5		11		50~180	0.2	0.4
6		12		180~	0.3	0.5

DIM. MM	DWN. EMILY	DATE 06-23-09'	TITLE 1024768D (12.1")
IE NO.	CHK.	DATE	
PARTS NO. LCM−1	APPD.	DATE	DWG. NO. *090679MA

晶采光電科技 AMPIRE

SHEET 1 OF 1