



晶采光電科技股份有限公司  
AMPIRE CO., LTD.

## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-19201080F2TZQW-A0</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

☐ Approved For Specifications

☐ Approved For Specifications & Sample

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## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2017/03/21	--	New Release	Mark
2017/03/23		Correct the Temperature parameters	Mark

## 1.0 General Descriptions

### 1.1 Introduction

The LCM 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 15.6 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 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 a low reflection and higher color type.

### 1.2 Features

- 3.3 V Logic Power
- [LVDS \(2ch\) Interface for 1920 RGB x 1080 resolution](#)
- 16.7M Colors (6bit + HFRC)
- On board LED Driving circuit
- Green Product (RoHS)

### 1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	15.6	Inch
Active Area	344.16 (H) ×193.59 (V)	mm
Pixel Format	1920 (H) x RGB x 1080 (V)	-
Pixel Pitch	0.17925 (H) X 0.17925 (V)	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	1500 (Typ)	cd /m2
Contrast Ratio	800 : 1 (Typ)	-
Input Voltage	3.3	V
Outline Dimensions	363.8x215.9Vx13.28	mm
Support Color	16.7M	-

## 2.0 Absolute Maximum Ratings

ITEM	SYMBOL	VALUES		UNIT	REMARK
		MIN	MAX		
Logic Signal Input Level	V <sub>in</sub>	-0.3	+4.0	V	
Operation Temperature	T <sub>op</sub>	-30	75	°C	
Storage Temperature	T <sub>st</sub>	-30	80	°C	

Note (1) Permanent damage may occur to the LCD module if you operate beyond this specification. Functional operation should be restricted to the conditions which described under normal operating conditions.

Note (2) T<sub>a</sub> =25±2°C

### 3.0 ELECTRICAL SPECIFICATIONS

**Table 3 Electrical Specifications**

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	$V_{DD}$	3.0	3.3	3.6	V	Note 1
Permissible Input Ripple Voltage	$V_{RF}$	-	-	100	mV	At $V_{DD} = 3.3V$
Power Supply Current	$I_{DD}$	-	300	-	mA	Note 1
Differential Input Voltage	$V_{ID}$	200	-	600	mV	
Power Consumption	$P_D$	-	1.0	2.3	W	Note 1
	$P_{BL}$	-	-	5.7	W	Note 2
	$P_{total}$	-	-	8.0	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 at 25°C.

a) Typ : Mosaic Pattern

b) Max : R/G/B Pattern



2. Calculated value for reference ( $V_{LED} \times I_{LED}$ )

## 4. Interface Timings

### 4.1 Timing Characteristics

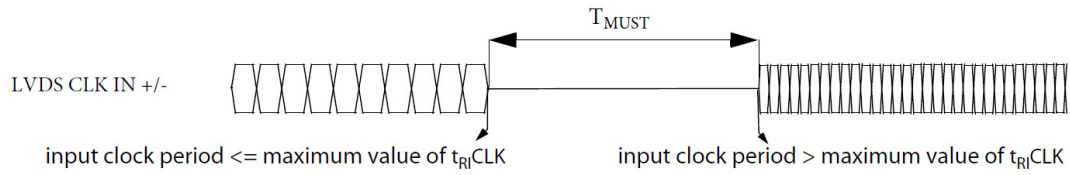
Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	100	141.4	160	MHz
	High Time	Tch	-	4/7	-	Tc
	Low Time	Tcl	-	3/7	-	Tc
Frame Period		Tv	1090	1100	1238	lines
			-	60	-	Hz
			-	16.7	-	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	2080	2142	2400	clocks
Horizontal Display Period		Thd	-	1920	-	clocks

Note\*: This Module can support low frame refresh rate 50Hz & 40Hz.

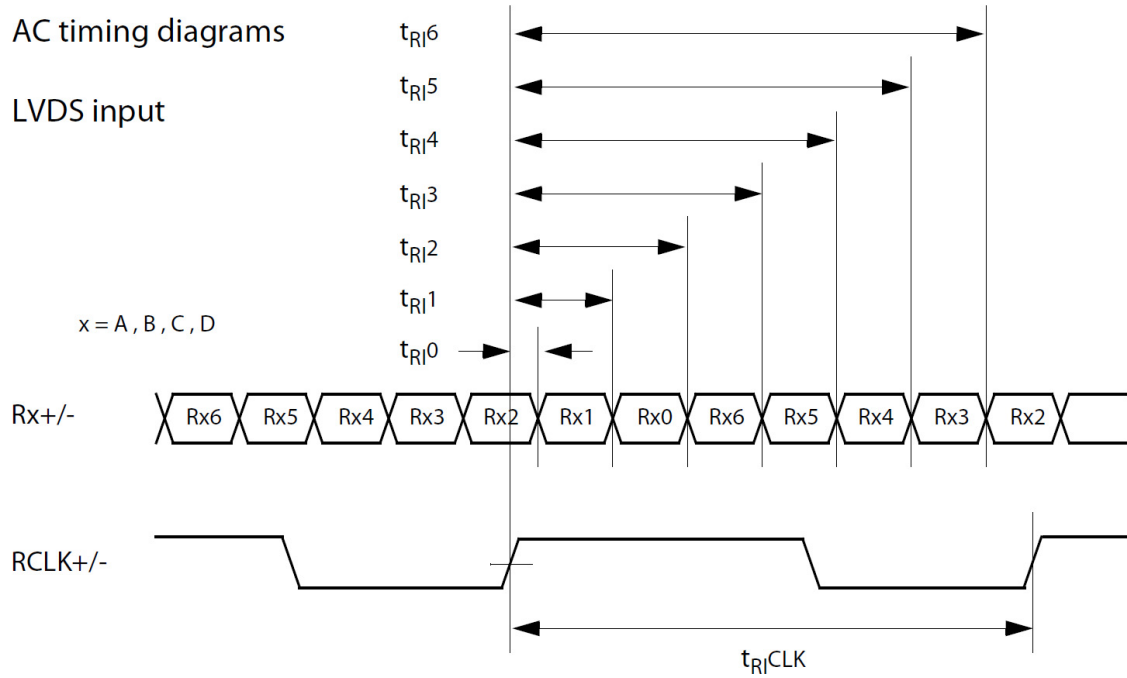
## 4.2 Timing diagram

AC Specifications (under normal operating conditions unless otherwise specified)

**Figure 2-4 Mode Unstable Silent Time**



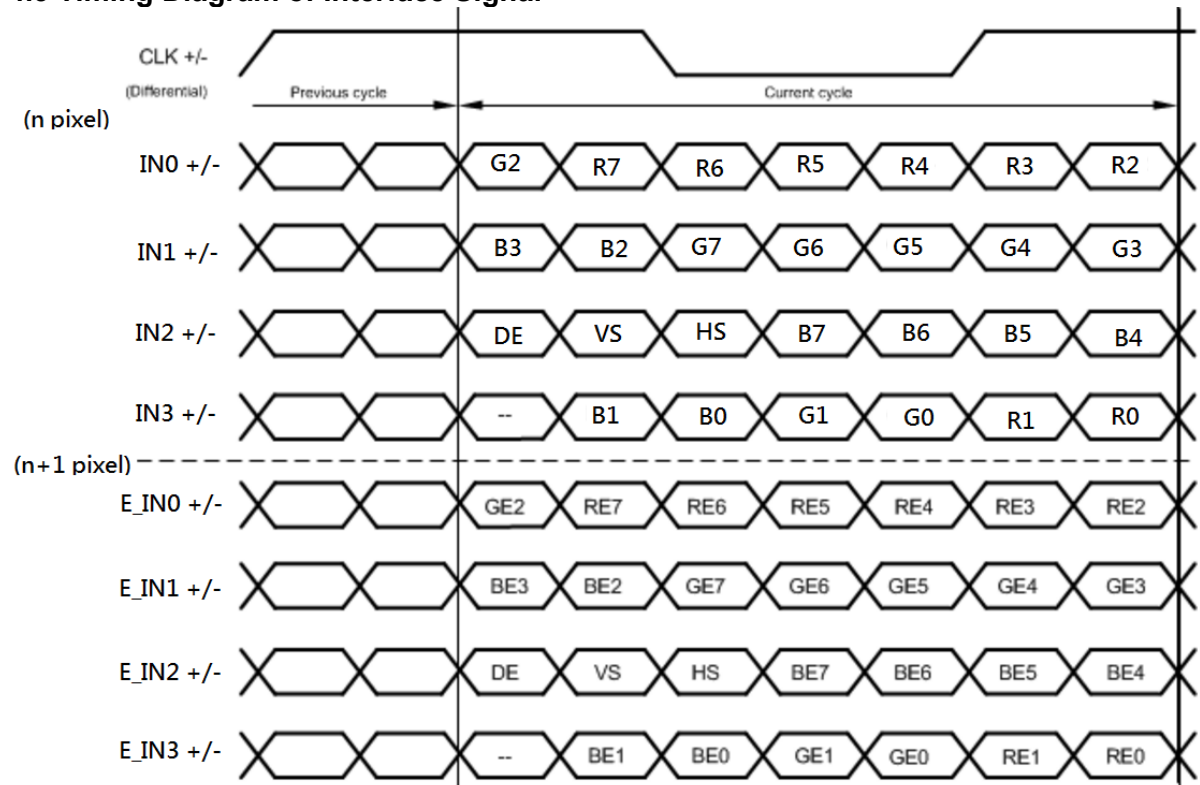
**Figure 2-5 LVDS Receiver AC Timing**



Symbol	Parameter	Min	Typ	Max	Units
$F_{IC}$	Input LVDS Clock Frequency	25		85	MHz
$T_{ICS}$	Input LVDS Clock Skew between any ports			1/5	$T_{IC}$
$T_{ICJ}$	Input LVDS Clock Jitter			2	ns
$T_{must}$	Mode Unstable Silent Time	10			ms
$t_{RLCLK}$	Input CLK period	11.8		40	ns
$t_{RL0}$	Input Data Position 0 ( $t_{RLCLK} = 11.8ns$ )	-0.3	0	+0.3	ns

$t_{R1}$	Input Data Position 1 ( $t_{RI}CLK = 11.8ns$ )	$\frac{t_{RI}CLK}{7} - 0.3$	$\frac{t_{RI}CLK}{7}$	$\frac{t_{RI}CLK}{7} + 0.3$	ns
$t_{R2}$	Input Data Position 2 ( $t_{RI}CLK = 11.8ns$ )	$2\frac{t_{RI}CLK}{7} - 0.3$	$2\frac{t_{RI}CLK}{7}$	$2\frac{t_{RI}CLK}{7} + 0.3$	ns
$t_{R3}$	Input Data Position 3 ( $t_{RI}CLK = 11.8ns$ )	$3\frac{t_{RI}CLK}{7} - 0.3$	$3\frac{t_{RI}CLK}{7}$	$3\frac{t_{RI}CLK}{7} + 0.3$	ns
$t_{R4}$	Input Data Position 4 ( $t_{RI}CLK = 11.8ns$ )	$4\frac{t_{RI}CLK}{7} - 0.3$	$4\frac{t_{RI}CLK}{7}$	$4\frac{t_{RI}CLK}{7} + 0.3$	ns
$t_{R5}$	Input Data Position 5 ( $t_{RI}CLK = 11.8ns$ )	$5\frac{t_{RI}CLK}{7} - 0.3$	$5\frac{t_{RI}CLK}{7}$	$5\frac{t_{RI}CLK}{7} + 0.3$	ns
$t_{R6}$	Input Data Position 6 ( $t_{RI}CLK = 11.8ns$ )	$6\frac{t_{RI}CLK}{7} - 0.3$	$6\frac{t_{RI}CLK}{7}$	$6\frac{t_{RI}CLK}{7} + 0.3$	ns

#### 4.3 Timing Diagram of Interface Signal

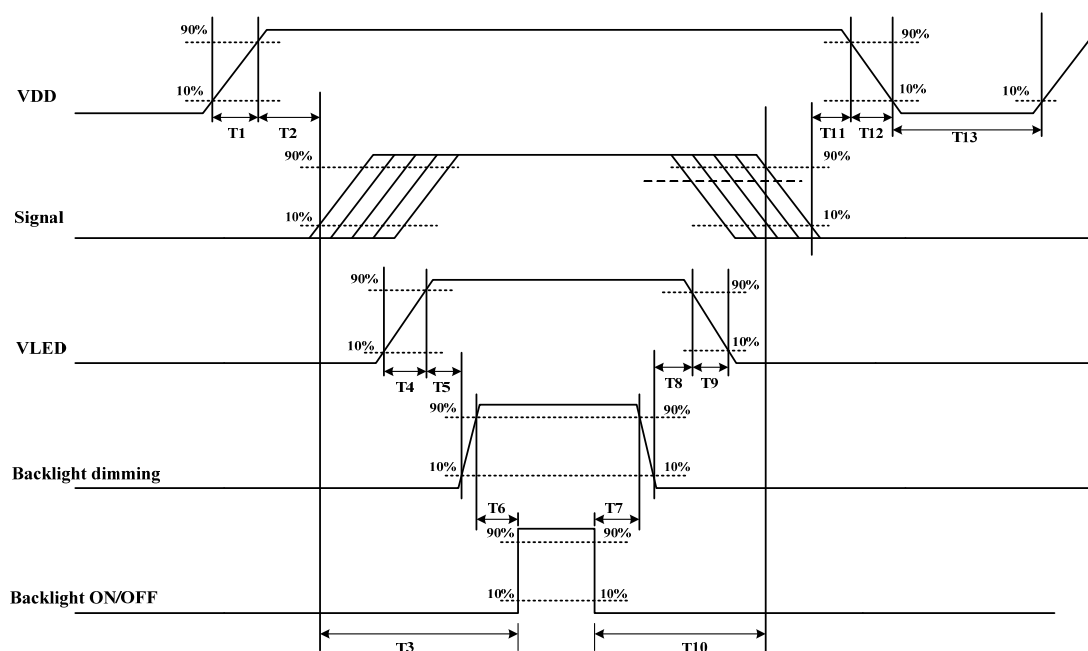




#### 4.4 Power Sequence

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

VDD power and LED on/off sequence are as follows. Interface signals are also shown in the chart. Signal shall be Hi-Z state or low level when VDD is off.



Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	0	40	50	[ms]
T3	200	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	-	-	10	[ms]
T10	110	-	-	[ms]
T11	0.5	16	50	[ms]
T12	-	-	100	[ms]
T13	1000	-	-	[ms]

## 5.0 Optical Specifications

The optical characteristics are measured under stable conditions as following notes

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	$\theta_L$	80	85	-	degree	Note1
		$\theta_R$	80	85	-		
	Vertical	$\theta_T$	80	85	-		
		$\theta_B$	80	85	-		
Contrast Ratio	Center		-	800	-	-	Note2
Response Time	Rising + Falling		-	30	35	ms	Note5
Color Chromaticity (CIE1931)	Red	x	Typ. -0.05	0.616	Typ. +0.05	-	Note3
	Red	y		0.339		-	
	Green	x		0.313		-	
	Green	y		0.582		-	
	Blue	x		0.156		-	
	Blue	y		0.134		-	
	White	x		0.313		-	
	White	y		0.329		-	
White Luminance	Center		1200	1500	-	cd/m <sup>2</sup>	Note4
Luminance Uniformity	9Points		75	-	-	%	Note4
Cross Talk	CT	$\Theta=0$	-	-	2.0	%	Note6

Notes 1 : Viewing angle is the angle at which the contrast ratio is greater than 10.

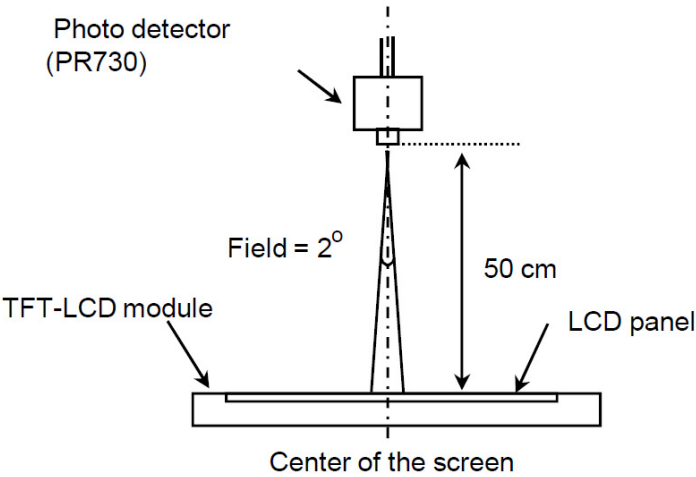
The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface(see Figure1).

Notes 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 Figure1).

Luminance Contrast Ratio (CR) is defined mathematically as  $CR = \text{Luminance when displaying a white raster} / \text{Luminance when displaying a black raster}$ .

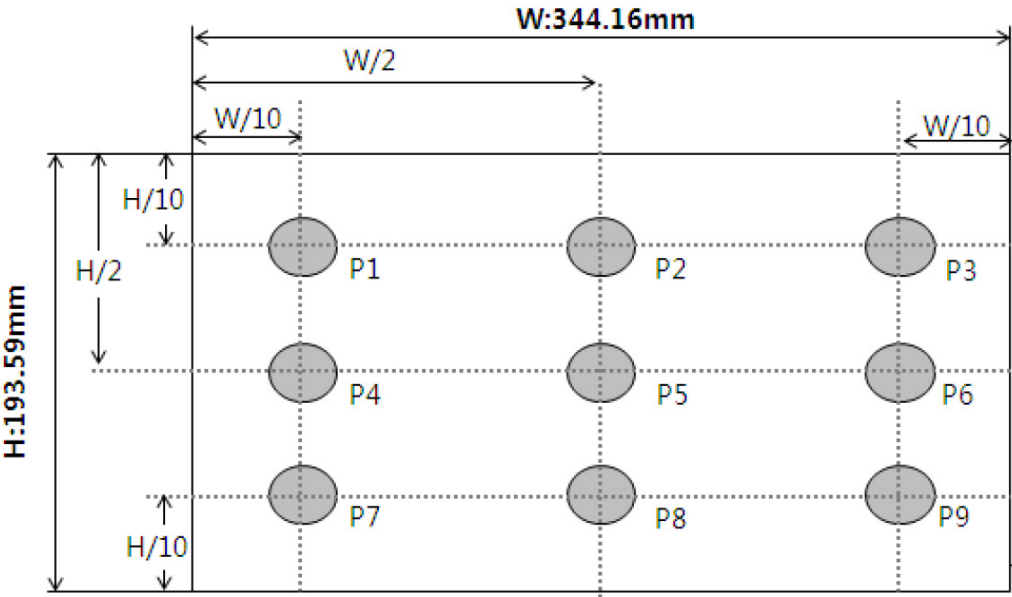
Notes 3 : Reference only / Standard Front Surface Treatment Measured with green cover glass. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

**Figure 1. Measurement Set Up**



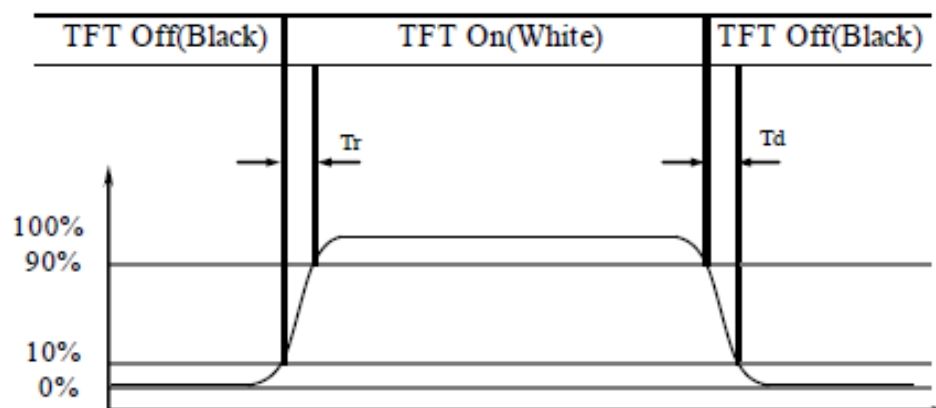
Optical characteristics measurement setup

**Figure 2. White Luminance and Uniformity Measurement Locations (9 points)**



Center Luminance of white is defined as luminance values of center 9 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. Response Time Testing



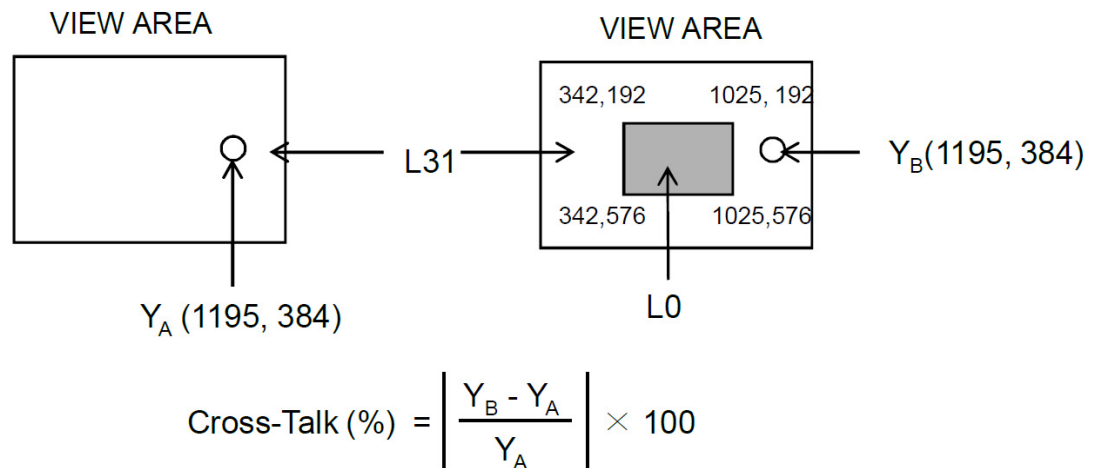
Note 5.

The electro-optical response time measurements shall be made as Figure 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is  $T_r$ , and 90% to 10% is  $T_d$ .

Note 6.

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 (Refer to Figure 4).

**Figure 4. Cross Modulation Test Description**



Where:

$Y_A$  = Initial luminance of measured area (cd/m<sup>2</sup>)

$Y_B$  = Subsequent luminance of measured area (cd/m<sup>2</sup>)

The location measured will be exactly the same in both patterns

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 (Refer to FIGURE 4).

## 6. Interface Connections

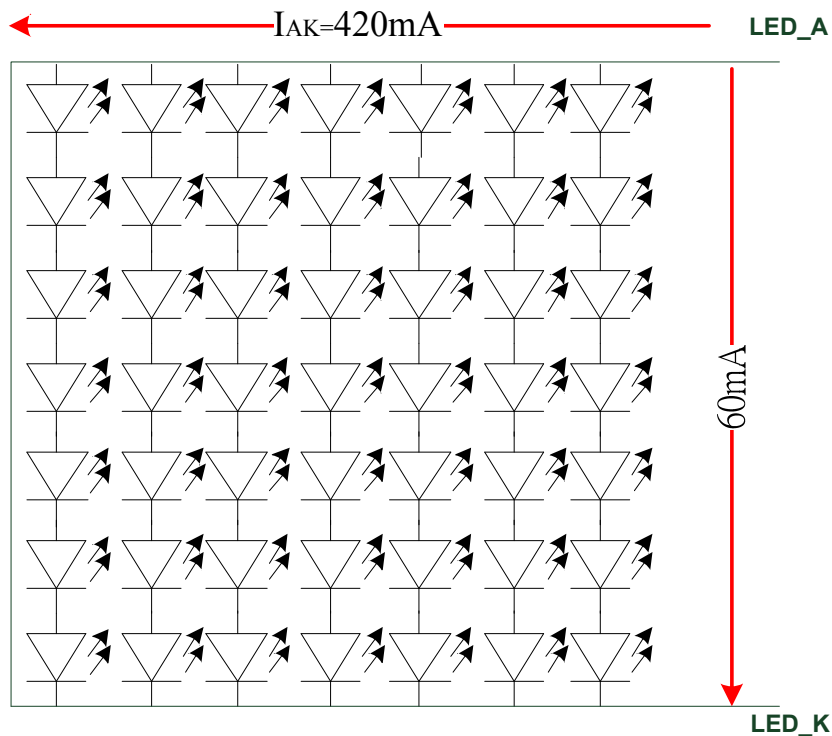
Pin #	Signal Name	Description
1	GND	Ground
2	NC	Not Connect
3	VDD	Power Supply
4	VDD	Power Supply
5	GND	Ground
6	GND	Ground
7	NC	Not Connect
8	NC	Not Connect
9	GND	Ground
10	IN0-	-LVDS differential data input
11	IN0+	+LVDS differential data input
12	IN1-	-LVDS differential data input
13	IN1+	+LVDS differential data input
14	IN2-	-LVDS differential data input
15	IN2+	+LVDS differential data input
16	CLK-	-LVDS differential data input
17	CLK+	+LVDS differential data input
18	IN3-	-LVDS differential data input
19	IN3+	+LVDS differential data input
20	E_IN0-	-LVDS differential data input
21	E_IN0+	+LVDS differential data input
22	E_IN1-	-LVDS differential data input
23	E_IN1+	+LVDS differential data input
24	E_IN2-	-LVDS differential data input
25	E_IN2+	+LVDS differential data input
26	NC	Not Connect
27	NC	Not Connect
28	E_IN3-	-LVDS differential data input
29	E_IN3+	+LVDS differential data input
30	GND	Ground
31	GND	Ground
32	VLED	LED Power Supply

33	VLED	LED Power Supply
34	VLED	LED Power Supply
35	VLED	LED Power Supply
36	LED_EN	LED Enable Pin : High→Enable
37	LED_PWM	PWM Signal for LED Dimming Control
38	GND	Ground
39	GND	Ground
40	GND	Ground

## 7. LED Driving Conditions

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
LED Driver voltage	VLED	-	12	-	V	
Power Supply Current For LED Driver	I <sub>LED</sub>	-	1.47	-	A	VLED=12V V <sub>ADJ</sub> =5V (duty 100%)
ADJ Input Voltage	V <sub>ADJ</sub>	-	5	VLED	V	duty=100%
ADJ Dimming Freq.	F <sub>ADJ</sub>	0.1		30	kHz	
LED voltage	V <sub>AK</sub>	--	42	46.2	V	I <sub>AK</sub> =420mA Ta=25°C
LED current	I <sub>AK</sub>	--	420	--	mA	Ta=25°C
		--	315	--	mA	Ta=60°C
LED Life Time	-	--	50K	--	Hour	Note (2)

Note (1) The constant current source is needed for white LED back-light driving. When LCM is operated at 60 deg.C ambient temperature, the I<sub>L</sub> of the LED back-light should be adjusted to 420mA max



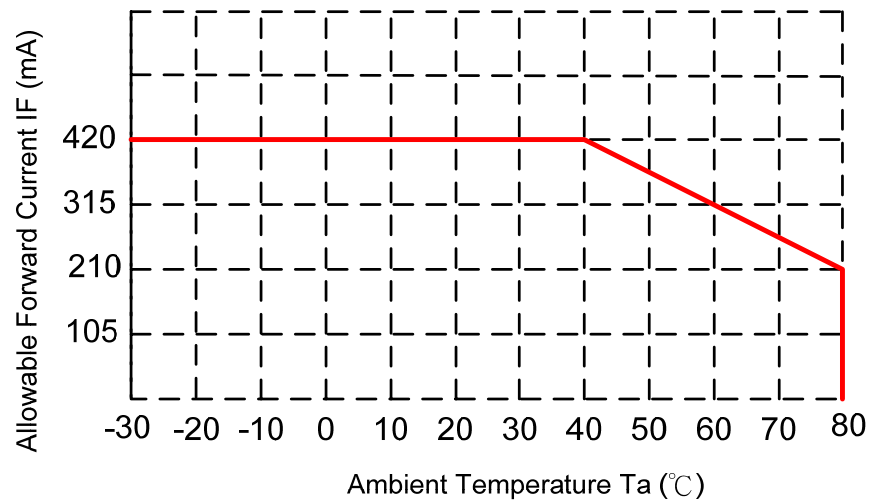


Note (2) : Condition:  $T_a=25^{\circ}\text{C}$ , continuous lighting

Life time is estimated data. Definitions of failure:

1. LCM brightness becomes half of the minimum value.
2. LED doesn't light normally.

When LCM is operated over  $40^{\circ}\text{C}$  ambient temperature, the ILED should follow :



## 8. Reliability Test

The reliability test items and its conditions are shown below.

Test Item	Test Conditions	Note
High Temperature Operation	75±3°C , t=240 hrs	
Low Temperature Operation	-30±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	40°C, 90% RH , 240 hrs	1,2
Thermal Shock Test	-30°C (30min) ~ 60°C (30min) , 27 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10~55~10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axes Duration : 30 min/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).

## **9 . GENERAL PRECAUTION**

### **9.1 Use Restriction**

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

### **9.2 Disassembling or Modification**

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. AMPIRE does not warrant the module, if customers disassemble or modify the module.

### **9.3 Breakage of LCD Panel**

- (1) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- (2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- (3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- (4) Handle carefully with chips of glass that may cause injury, when the glass is broken.

### **9.4 Electric Shock**

- (1) Disconnect power supply before handling LCD module.
- (2) Do not pull or fold the LED cable.
- (3) Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

### **9.5 Absolute Maximum Ratings and Power Protection Circuit**

- (1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- (2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- (3) It's recommended to employ protection circuit for power supply.

## **9.6 Operation**

- (1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- (2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- (3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- (4) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.
- (5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

## **9.7 Mechanism**

Please mount LCD module by using mounting holes arranged in four corners tightly.

## **9.8 Static Electricity**

- (1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- (2) Because LCD modules use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

## **9.9 Strong Light Exposure**

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

## **9.10 Disposal**

When disposing LCD module, obey the local environmental regulations.

## **9.11 Others**

Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

# 10.0 Outline Dimension

