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-19201200B2TZQW-00**
Approved by	
Date	

☐**Approved For Specifications**
☐**Approved For Specifications & Sample**

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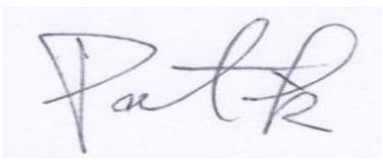
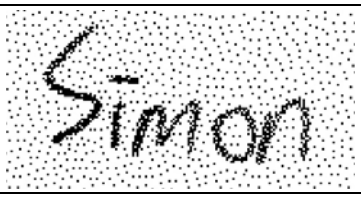
		

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2016/3/23	--	New Release	Emil

1.0 General Descriptions

1.1 Introduction

The LCM is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit. The screen format is intended to support the 16:10 WUXGA, 1920(H) x1200(V) screen and 16M colors (RGB 6-bits + Hi-FRC).

1.2 Features

- 3.3 V Logic Power
- LVDS (2ch) Interface for 1920RGB x 1200 resolution.
- 16M Colors (6bit + 2 bits Hi-FRC)
- Data Enable Signal Mode
- A grade LCD monitor

1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	10.1	Inch
Active Area	216.81(H) x 137.2(V)	mm
Pixel Format	1920 (H) x RGB x 1200 (V)	-
Pixel Pitch	0.11292 (H) × 0.11292 (V)	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black (AHVA mode)	-
White Luminance	400 (Typ)	cd /m^2
Contrast Ratio	800 : 1 (Typ)	-
Input Voltage	3.3	V
Outline Dimensions	230.12(H) x 150.2(V) x 6.45(D)	mm
Support Color	16M (6bit + HiFRC)	-

2.0 Absolute Maximum Ratings

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Logic Signal Input Level	V_{in}	-0.3	--	+4.5	V	Ta=25℃
Operating Temperature	Tops	0	--	50	℃	
Storage Temperature	Tstg	-20	--	60	℃	

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) Ta =25±2℃

3.0 Electrical Specifications

The power specification are measured under 25℃ and frame frequency under 60Hz.

Symbol	Parameter	Conditions	Min.	Typ	Max	Units
V_{IH}	High Level Input Voltage	/PDWN, MODE[2:0]	2.0		V_{CC}	V
V_{IL}	Low Level Input Voltage	R/F, OE, MAP Pin	GND		0.8	V
V_{OH}	High Level Output Voltage	I_{OH}= -8mA	2.4			V
V_{OL}	Low Level Output Voltage	I_{OL}= 8mA			0.4	V

Note (1) Maximum Measurement Condition : White Pattern at 3.3V driving voltage. (Pmax=V3.3 x Iwhite)

3.1 Backlight Unit

3.1.1 LED characteristics

Parameter	Symbol	Min	Typ	Max	Units	Condition
Backlight Power Consumption	PLED	-	-	2.5	[Watt]	(Ta=25℃@400nits)
LED Life-Time	N/A	12,000	-	-	Hour	(Ta=25℃@400nits) Note1.
LED Forward Voltage	VF	2.7	2.95	3.3	[Volt]	(Ta=25℃)
LED Forward Voltage of every LED string	VF-string	-	14.75	16.5	[Volt]	(Ta=25℃) Note2.
LED Forward Current	IF	-	22	-	[mA]	(Ta=25℃)

Note 1. The LED life-time define as the estimated time to 50% degradation of initial luminous.

3.1.2 Backlight input signal characteristics

Parameter	Symbol	Min	Typ	Max	Units	Remark
LED Power Supply	VLED	3		12	[Volt]	Define as Connector Interface (Ta=25℃) Note1.
LED Enable Input High Level	VLED_EN	1.7	-	5.5	[Volt]	
LED Enable Input Low Level		-	-	0.8	[Volt]	
PWM Logic Input High Level	VPWM_EN	1.7	-	5.5	[Volt]	
PWM Logic Input Low Level		-	-	0.8	[Volt]	
PWM Input Frequency	FPWM	200	-	10K	Hz	
PWM Duty Ratio	Duty	1		100	%	

Note 1: The input high level voltage conversion to 2.5V by level shift circuit.

Note 2: The LED PWM Logic Input Low Level Voltage must have an output impedance close to 0 ohm in front of input connector.

4.0 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	θ_L	80	85	-	degree	Note1
		θ_R	80	85	-		
	Vertical	θ_T	80	85	-		
		θ_B	80	85	-		
Contrast Ratio	Center		600	800	-	-	Note2
Response Time	Rising + Falling		-	25	35	ms	Note5
Color Chromaticity (CIE1931)	Red	x	Typ. -0.05	0.593	Typ. +0.05	-	Note3
	Red	y		0.341		-	
	Green	x		0.324		-	
	Green	y		0.589		-	
	Blue	x		0.154		-	
	Blue	y		0.123		-	
	White	x		0.313		-	
	White	y		0.329		-	
White Luminance	Center		290	340	-	cd/m^2	Note4
Luminance Uniformity	9Points		75	-	-	%	Note4
Cross Talk	CT	Θ=0	-	-	4.0	%	Note6

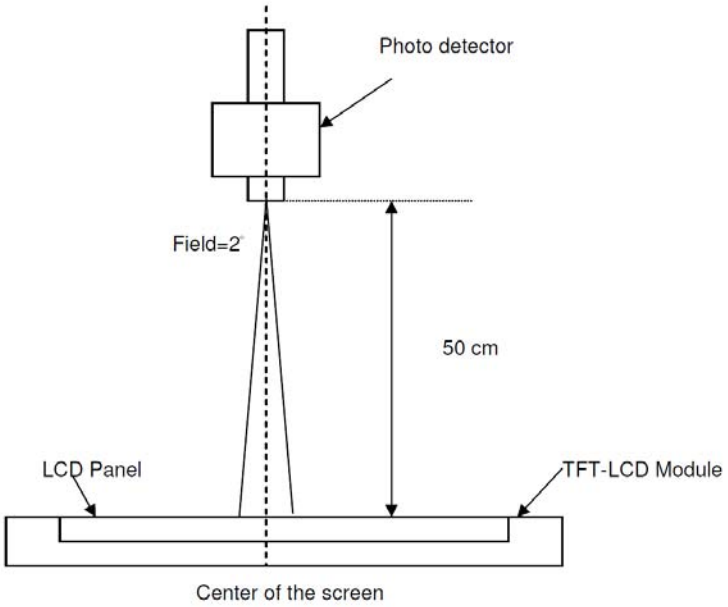
Note(1)
Viewing angle defines as the angle at the contrast ratio over 10. Besides, the viewing angles are determined by the horizontal (3, 9 o'clock) and vertical (6, 12 o'clock) direction with respect to the optical axis which is normal to the LCD surface (see Figure1).

Note(2)
Contrast measurements shall be made at viewing angle Θ=0 and the center of the LCD surface. Luminance shall be measured with all pixels in the view field. Moreover, you need to set white at first, and then you have to change to dark (black) state (see Figure1). Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance as displaying a

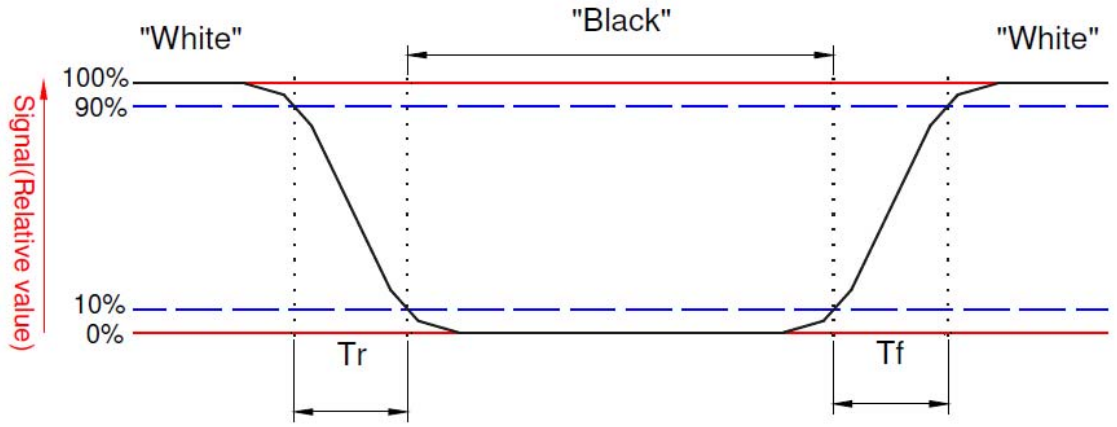
white raster / Luminance as displaying a black raster.

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

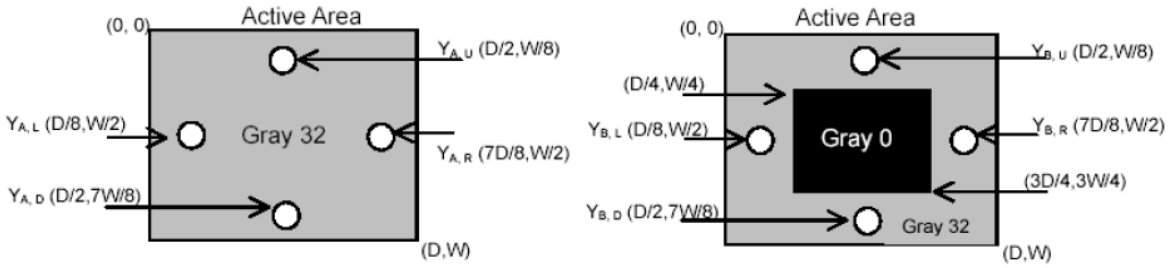
Note(4)
Measurement method: The LCD module should be stabilized at the given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 30 minutes in a stable, windless, and dark room, and it should be measured in the center of screen.



Note(5)
Definition of response time: The output signals of BM-7 or equivalent are measured when the input signals changed from “Black” to “White” (falling time) and from “White” to “Black” (rising time), respectively. The response time interval between the 10% and 90% signal, and it is shown below.



Note(6)
Definition of Cross Talk (CT): CT = | YB – YA | / YA × 100 (%), where YA = Luminance of measured location without gray level 0 pattern (cd/m^2)



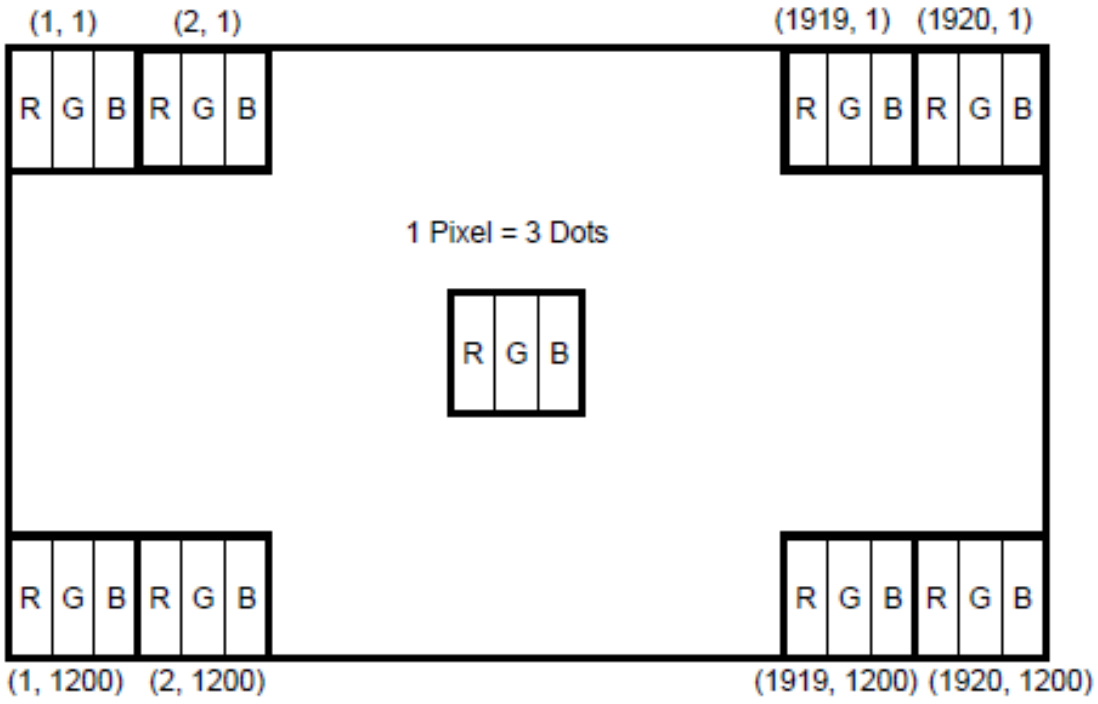
5.0 Interface Connections

5.1 Electrical Interface Connection

Pin #	Signal Name	Description
1	GND	Ground
2	NC	Not Connect
3	VDD	Power Supply, 3.3V (typical)
4	VDD	Power Supply, 3.3V (typical)
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 (3~12V)
33	VLED	LED Power Supply (3~12V)
34	VLED	LED Power Supply (3~12V)
35	VLED	LED Power Supply (3~12V)
36	LED_EN	LED Enable Pin：Hig→Enable (Typ : 3.3V)
37	LED_PWM	PWM Signal for LED Dimming Control
38	GND	Ground
39	GND	Ground
40	GND	Ground

5.2 Data Input Format

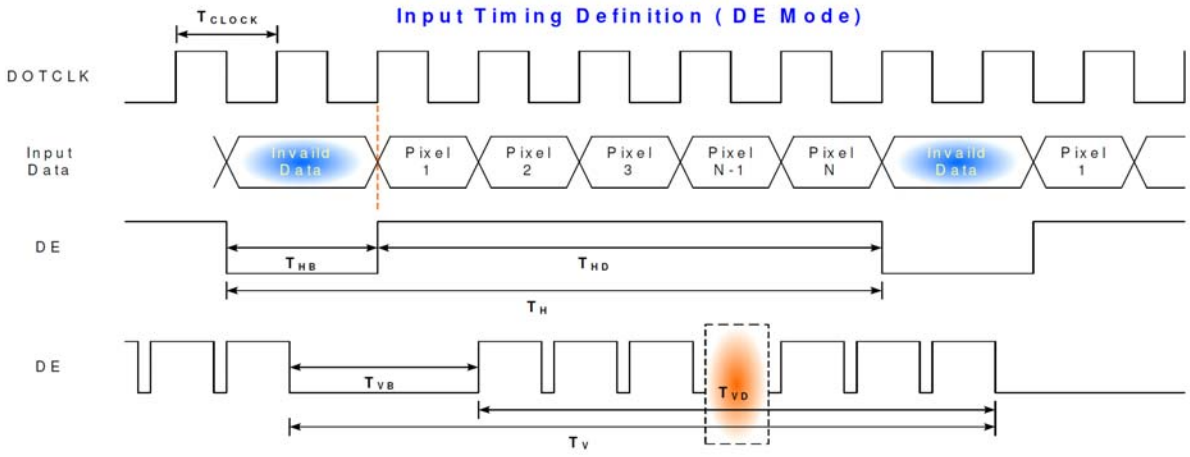


6. Interface Timings

6.1 Timing Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		---	---	60	---	Hz
Clock frequency		1/ T_{Clock}	---	150	---	MHz
Vertical Section	Period	T_V	---	1205	---	T_{Line}
	Active	T_{VD}	1200			
	Blanking	T_{VB}	---	2	---	
Horizontal Section	Period	T_H	---	1940	---	T_{Clock}
	Active	T_{HD}	1920			
	Blanking	T_{HB}	---	20	---	

6.2 Timing diagram



6.3 AC Timing Diagrams

V_{CC}=VCC=PVCC=LVCC=CVCC

Symbol	Parameter		Min.	Typ.	Max.	Units
t_{RCP}	CLKOUT Period (Fig4)		6.67	T	250	ns
t_{RCH}	CLKOUT High Time (Fig4)			$\frac{T}{2}$		ns
t_{RCL}	CLKOUT Low Time (Fig4)			$\frac{T}{2}$		ns
t_{DOUT}	TTL Data OUT Period (Fig5,6)		6.67	T	250	ns
t_{RS}	TTL Data Setup to CLKOUT(Fig5,6)		$0.45t_{DOUT}$ -0.45			ns
t_{RH}	TTL Data Hold to CLKOUT(Fig5,6)		$0.45t_{DOUT}$ -0.45			ns
t_{TLH}	TTL Low to High Transition Time (Fig 3)			0.7	1.0	ns
t_{THL}	TTL High to Low Transition Time (Fig 3)			0.7	1.0	ns
t_{SK}	Receiver Skew Margin (Fig7)	t_{RCIP}=65MHz	-650	0	650	ps
		t_{RCIP}=85MHz	-450	0	450	ps
		t_{RCIP}=108MHz	-250	0	250	ps
		t_{RCIP}=135MHz	-170	0	170	ps
t_{RIP1}	Input Data Position0 (Fig7)		$-t_{SK}$	0	$+t_{SK}$	ns
t_{RIP0}	Input Data Position1 (Fig7)		$\frac{t_{RCIP}}{7} - t_{SK}$	$\frac{t_{RCIP}}{7}$	$\frac{t_{RCIP}}{7} + t_{SK}$	ns
t_{RIP6}	Input Data Position2 (Fig7)		$2\frac{t_{RCIP}}{7} - t_{SK}$	$2\frac{t_{RCIP}}{7}$	$2\frac{t_{RCIP}}{7} + t_{SK}$	ns
t_{RIP5}	Input Data Position3 (Fig7)		$3\frac{t_{RCIP}}{7} - t_{SK}$	$3\frac{t_{RCIP}}{7}$	$3\frac{t_{RCIP}}{7} + t_{SK}$	ns
t_{RIP4}	Input Data Position4 (Fig7)		$4\frac{t_{RCIP}}{7} - t_{SK}$	$4\frac{t_{RCIP}}{7}$	$4\frac{t_{RCIP}}{7} + t_{SK}$	ns
t_{RIP3}	Input Data Position5 (Fig7)		$5\frac{t_{RCIP}}{7} - t_{SK}$	$5\frac{t_{RCIP}}{7}$	$5\frac{t_{RCIP}}{7} + t_{SK}$	ns
t_{RIP2}	Input Data Position6 (Fig7)		$6\frac{t_{RCIP}}{7} - t_{SK}$	$6\frac{t_{RCIP}}{7}$	$6\frac{t_{RCIP}}{7} + t_{SK}$	ns
t_{RPLL}	Phase Lock Loop Set (Fig8)				10.0	ms
t_{RCD}	RCLK +/- to CLK OUT Delay (Fig9) MODE<1:0>=LL DK=L, 75MHz		89.7		94	ns
t_{RCIP}	CLKIN Period (Fig7)		7.4		125.0	ns
t_{DEINT}	MODE<1:0>=HL (Single IN/ Dual OUT Mode) Only	DE input period (Fig9-1)	$4t_{RCIP}$	t_{RCIP}*(2n) n= integer		ns
t_{DEH}		DE input High time (Fig9-1)	$2t_{RCIP}$			ns
t_{DEL}		DE input Low time (Fig9-1)	$2t_{RCIP}$			ns

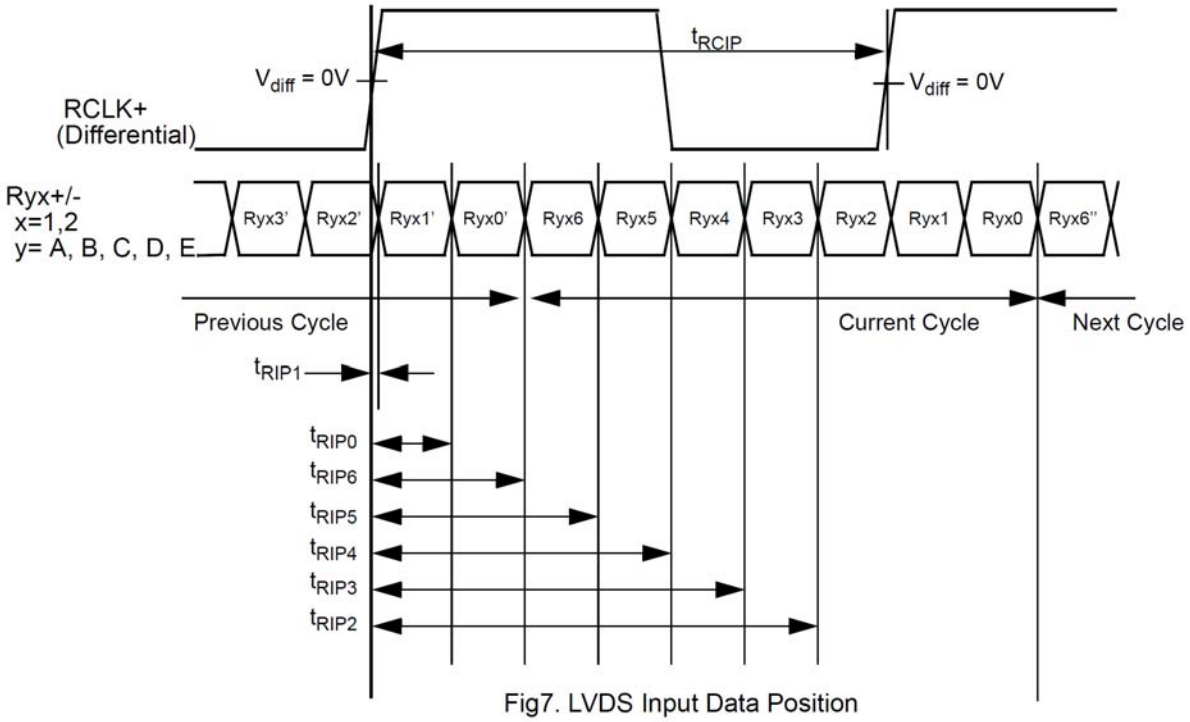
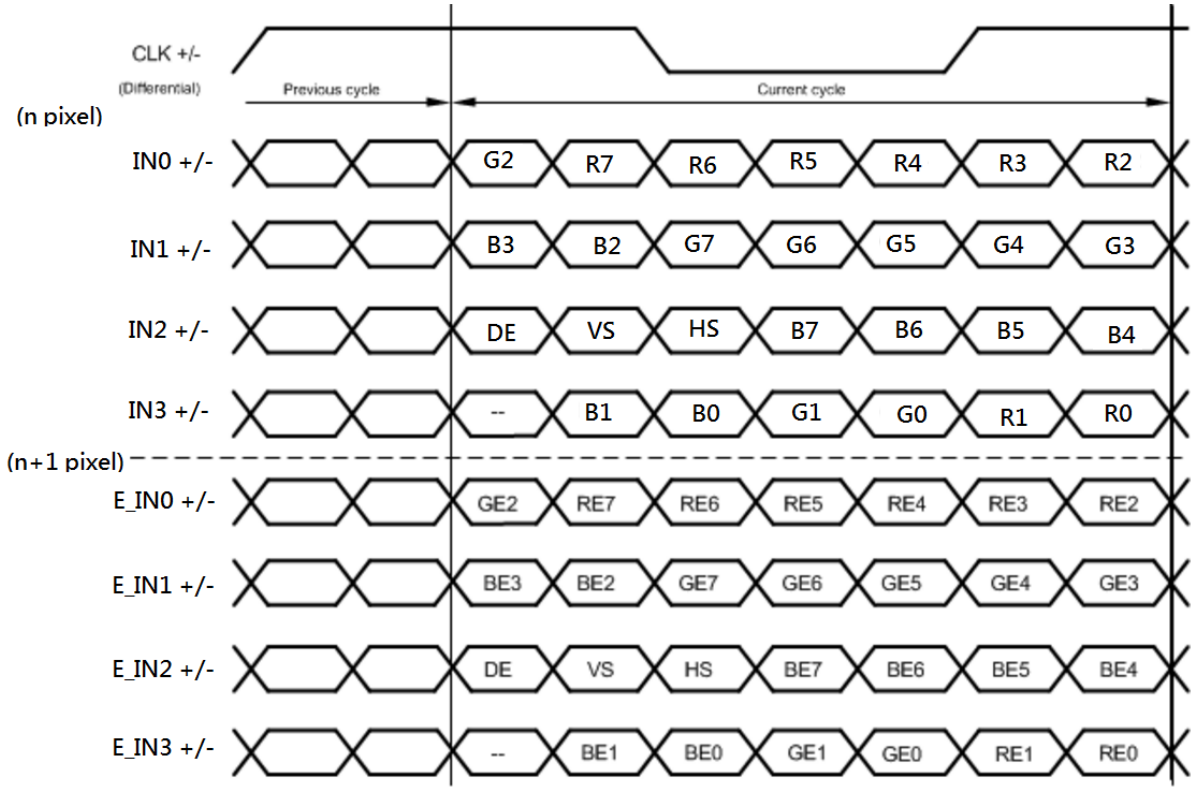


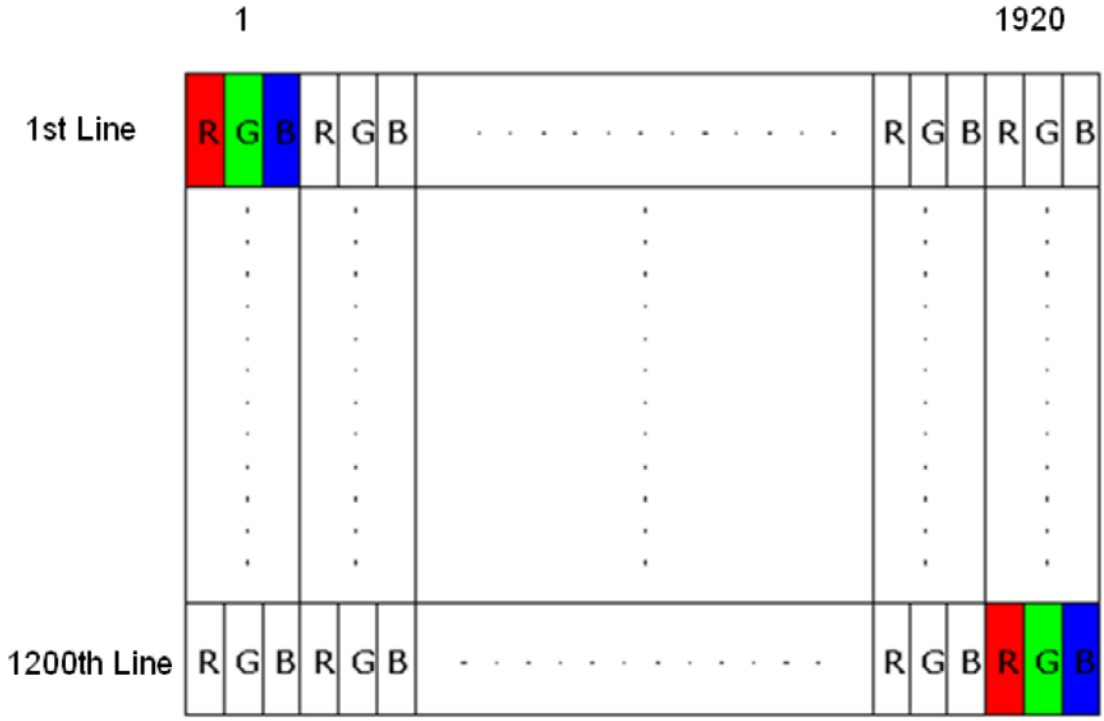
Fig7. LVDS Input Data Position

6.4 Timing Diagram of Interface Signal



7. Pixel Format Image

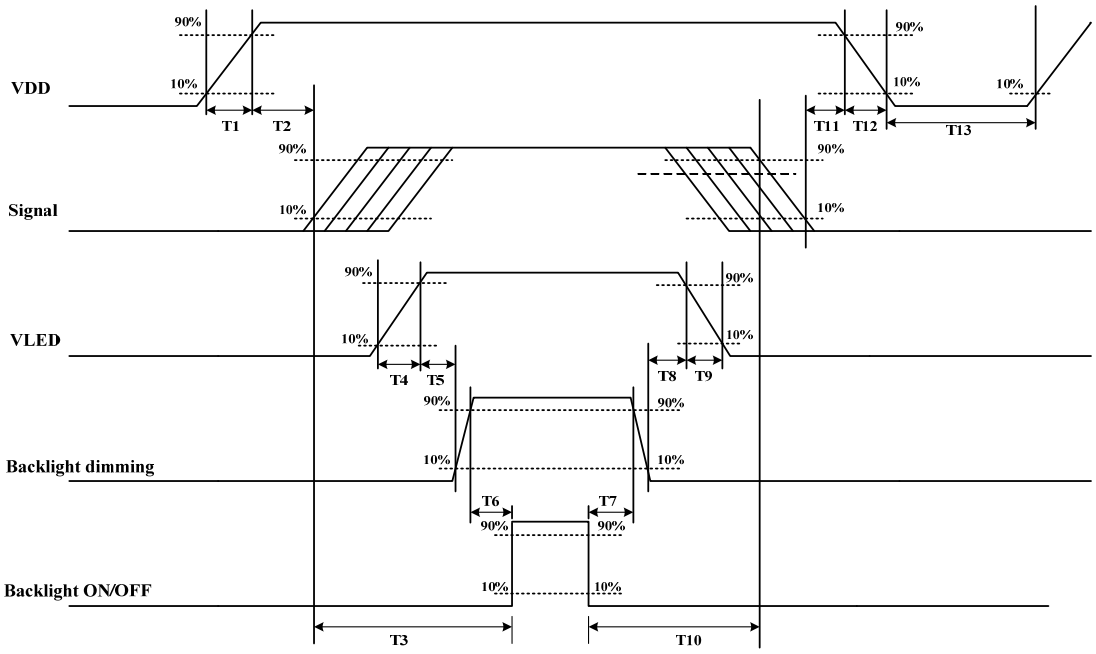
Following figure shows the relationship of the input signals and LCD pixel format.



8.0 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]

9.0 Reliability Test and INCOMING INSPECTION STANDARD

The reliability test items and its conditions are shown below.

Test Item	Test Conditions	Note
High Temperature Operation	50±3°C , t=240 hrs	
Low Temperature Operation	0±3°C , t=240 hrs	
High Temperature Storage	60±3°C , t=240 hrs	1,2
Low Temperature Storage	-20±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	40°C, 90% RH , 240 hrs	1,2
Thermal Shock Test	-20°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).

10.1 Inspection Standard

10.1.1 Classification of defects:

Defects are classified as major defects and minor defects, according to the degree of defectiveness defined herein.
Major defects: A major defect is a defect which is likely to result in failure Or reduce the materially usability of the product for its intended purpose.
Minor defects: A minor defect is a defect which is not likely to reduce the materially usability of the product for its intended purpose.

10.1.2 Inspection pattern:

Standard inspection patterns of dot defect are listed below. These patterns are standard criteria for judging dot defect.

Test Pattern	Defect
Black	For bright dot(s)
White	For Dark dot(s)
Red	Dark dot(s)
Green	Dark dot(s)
Blue	Dark dot(s)

10.1.3 Electrical inspection specification:

	Inspection Item		Specification
1.	Line defect		Can't be seen.
2.	Bright dots		≦ 0 dots
3.	Dark dots		≦ 5 dots
4.	Total dots defect		≦ 5 dots
5.	Continuous defect	Two continuous bright dots:	≦ 0 pairs
		Over three continuous bright dots (vertical, horizontal, oblique):	≦ 0 pairs
		Two continuous dark dots (vertical, horizontal, oblique):	≦ 2 pairs
		Over three continuous dark dots (vertical, horizontal, oblique):	≦ 1 pairs
		Distance between 2 Bright dots:	Disregarded
		Distance between 2 Dark dots:	Disregarded
6.		Distance between Dark dot and Bright Dot:	Disregarded
7.	Mura		5 % ND filter

Note (1) For pixel defect, one sub pixel (dot) is defined as one pixel.

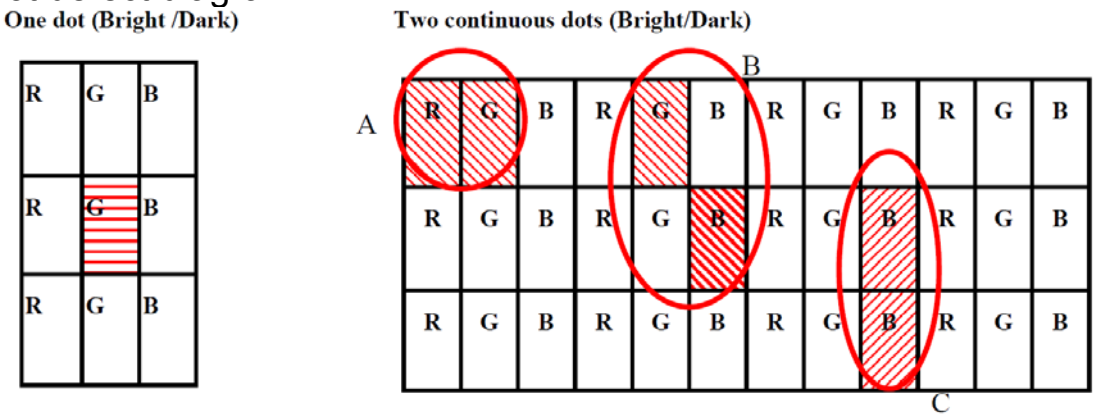
Note (2) Definition of two continuous bright dots: Only for two continuous dots (included vertical, horizontal, oblique type)

Note (3) Flicker adjust pattern is defined as dot inversion. (Red/Blue 32 level, 60Hz Frame rate, sub pixel checking mode)

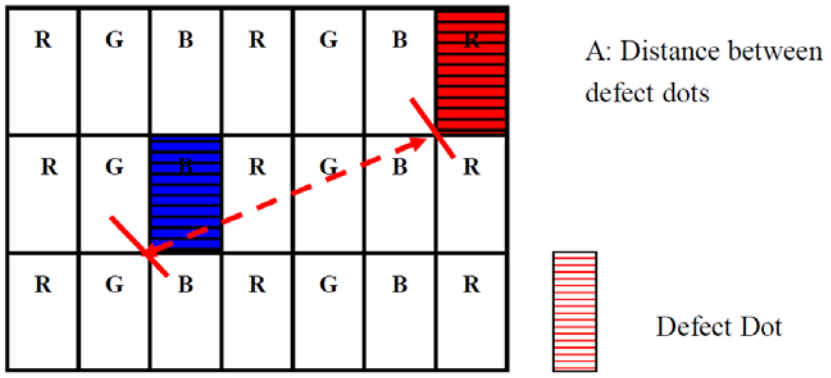
Note (4) Defect area (of dot defect) should be larger than 1/2, and the sub pixel would be counted as one dot defect.

Note (5) Adjacent-dot defect should be observed under the same display pattern in every one of white/Black/Green/Blue/Red/Gray pattern

Note (6) Dot defect diagram



- Definition of distance between defect dots as following



11.0 Use Precautions

11.1 Cautions when you take out the module

1. Pick the pouch only, when you take out module from a shipping package.

11.2 Cautions for handling the module

1. As the electrostatic discharges, it may break the LCD module. Therefore, you need to handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
2. Because the LCD panel and backlight element are made from fragile glass (epoxy) material, impulse and pressure should be avoided from the LCD module.
3. Because the surface of the polarizer is very soft and easily scratched, you can use a soft dry cloth without chemicals to clean it.
4. Do not pull the interface connector in or out while the LCD module is operating.
5. Put the module display side down on a flat horizontal plane.
6. Handle connectors and cables with care.

11.3 Cautions for the operation

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.
2. Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

11.4 Cautions for the atmosphere

1. Dew drop atmosphere should be avoided.
2. Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage it in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere which is recommended.

11.5 Cautions for the module characteristics

1. Do not apply fixed pattern data signal to the LCD module at product aging.
2. Applying fixed pattern for a long time may cause image sticking.

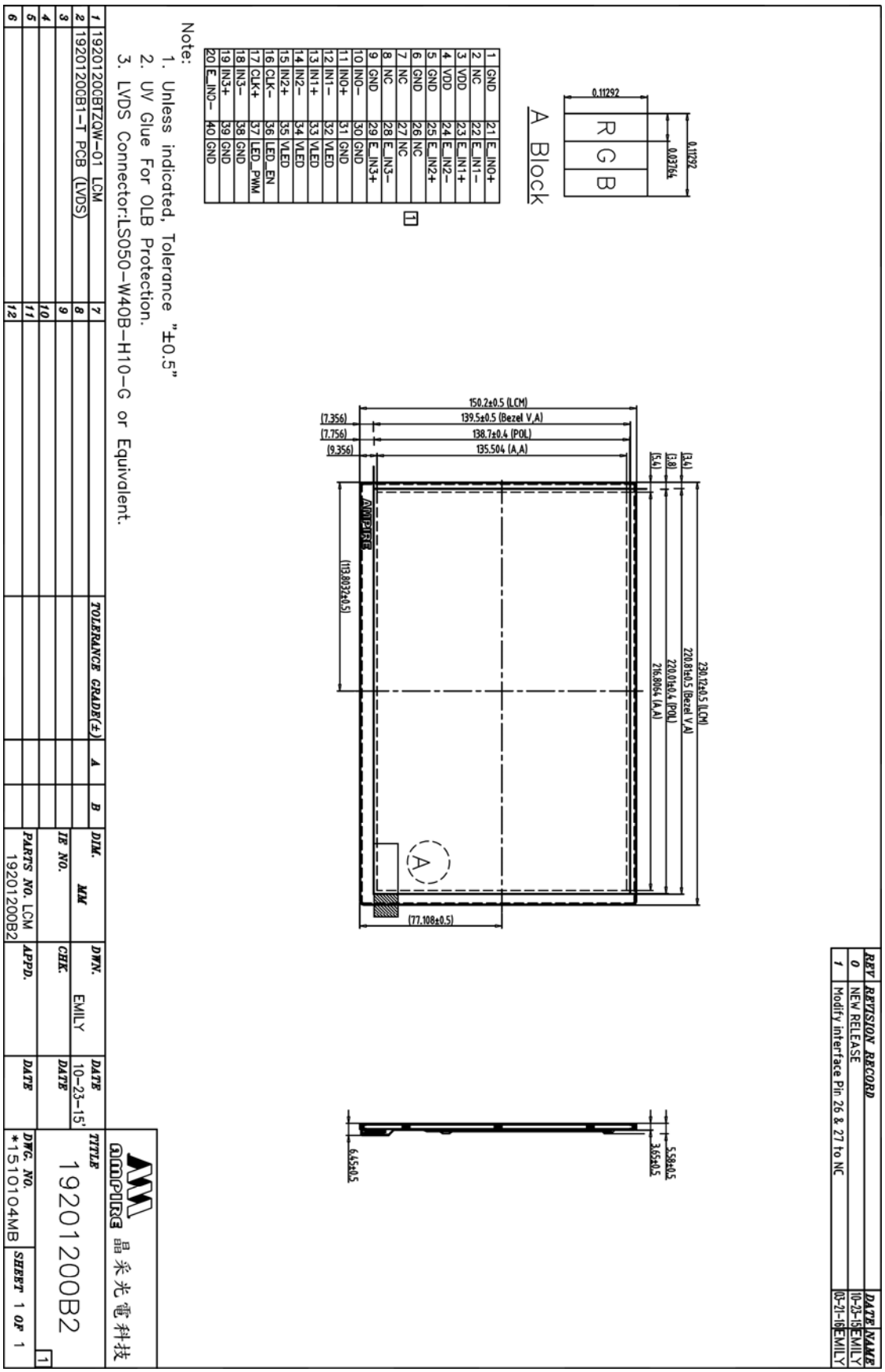
11.6 Cautions for the digitizer assembly

1. When the digitizer is assembling FPC connector, do not flip connector past 90° due to possible damage to connector.
2. When positioning digitizer underneath driver IC, do not lift driver IC past 90°, which may cause possible damage to drive IC pattern.
3. Please be warned that opening or closing of FPC will result in possible electrostatic discharge which may damage the LED during assembly of digitizer.

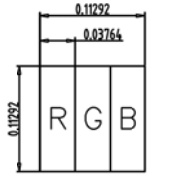
11.7 Other cautions

1. Do not re-adjust variable resistor or switch etc.
2. When you return the module for repair or etc., please pack the module to avoid being broken.
3. We recommend using the original shipping packages.
4. 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.

12.0 Outline Dimension



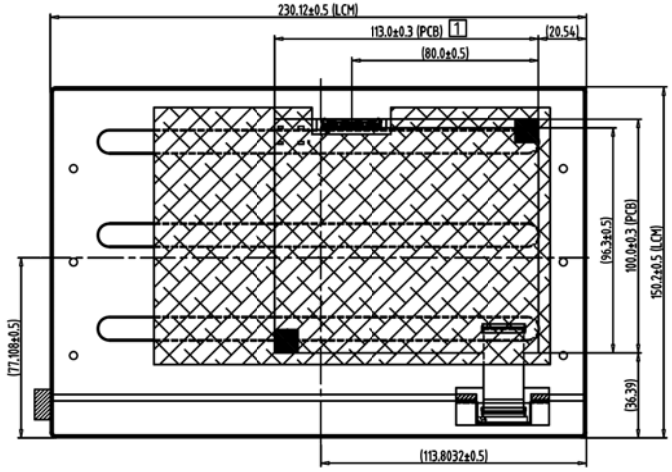
REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	10-23-15	EMILY
1	Modify interface Pin 26 & 27 to NC	03-21-16	EMILY



A Block

1	GND	21	E_IN0+
2	NC	22	E_IN1−
3	VDD	23	E_IN1+
4	VDD	24	E_IN2−
5	GND	25	E_IN2+
6	GND	26	NC
7	NC	27	NC
8	NC	28	E_IN3−
9	GND	29	E_IN3+
10	IN0−	30	GND
11	IN0+	31	GND
12	IN1−	32	VLED
13	IN1+	33	VLED
14	IN2−	34	VLED
15	IN2+	35	VLED
16	CLK−	36	LED_EN
17	CLK+	37	LED_PWM
18	IN3−	38	GND
19	IN3+	39	GND
20	E_IN0−	40	GND

[1]



Back View

Note:
1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. LVDS Connector:LS050-W40B-H10-G or Equivalent.

1	19201200BTZQW-01 LCM	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. EMILY	DATE 10-23-15'	TITLE 19201200B2
2	19201200B1-T PCB (LVDS)	8								[1]
3		9					IE NO.	CHK.	DATE	
4		10								
5		11					PARTS NO. LCM-1 19201200B2	APPD.	DATE	DWG. NO. *1510105MB
6		12								SHEET 1 OF 1

AMPIRE 晶采光電科技

AMPIRE CO., LTD.

Date: 2016/3/23