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-19201200B1TZQW-T00
APPROVED BY	
DATE	

☐Approved For Specifications
☐Approved For Specifications & Sample

AMPIRE CO., LTD.
4F., No.116, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City221, Taiwan (R.O.C.)
新北市汐止區新台五路一段 **116** 號 **4** 樓**(**東方科學園區 **A** 棟**)**
TEL:886-2-26967269 , FAX:886-2-26967196 or 26967270

APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2015/11/26	--	New Release	Alan

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 10.1 inch diagonally measured active area with WUXGA resolutions (1920 horizontal by 1200 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 1920RGB x 1200 resolution. (Max 120MHz / Ch)
- 16.7M Colors (6bit + HFRC)
- Data Enable Signal Mode
- Green Product (RoHS)
- Projective Capacitive Touch(I2C Interface).

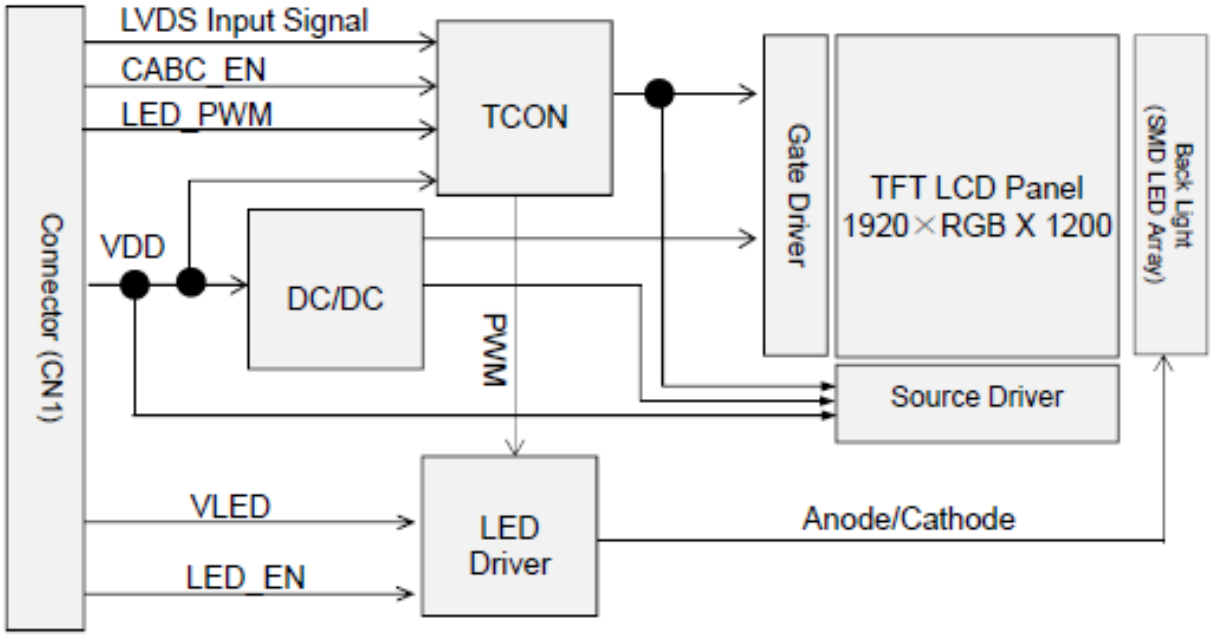
1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	10.1	Inch
Active Area	216.806(H) x 135.504(V)	mm
Pixel Format	1920 (H) x RGB x 1200 (V)	-
Pixel Pitch	0.1129 (H) × 0.1129 (V)	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	850 (Typ)	cd /m2
Contrast Ratio	800 : 1 (Typ)	-
Input Voltage	3.3	V
Outline Dimensions	232.65 (H) x 155.2 (V) x 10.41 (D)	mm
Support Color	16.7M (6bit + HFRC)	-

1.4 Functional Block Diagram

Shows the functional block diagram of the LCD module.

Figure 1 Block Diagram



2.0 Absolute Maximum Ratings

ITEM	SYMBOL	VALUES		UNIT	REMARK
		MIN	MAX		
Logic/LCD Driver Voltage	Vin	-0.3	+4.5	V	
Operation Temperature	T_{op}	-20	70	℃	
Storage Temperature	T_{st}	-30	80	℃	

3.0 Electrical Specifications

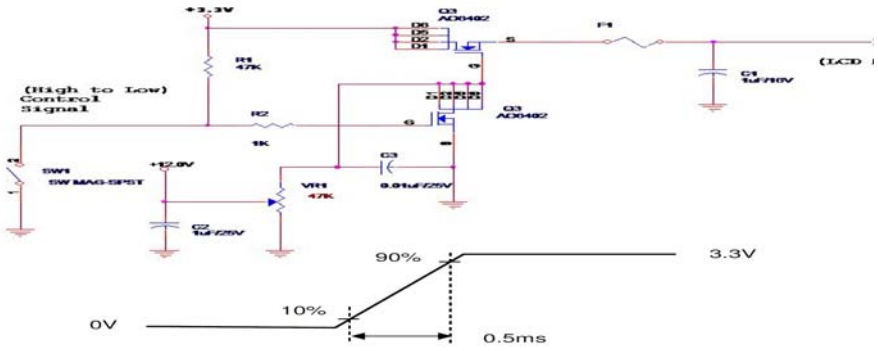
Table 3 Electrical Specifications

Parameter		Min.	Typ.	Max.	Unit	Note
LCD Logic Power Supply Voltage	V_{DD}	3.0	3.3	4.2	V	
LCD Logic Power Supply Current	I_{DD}	-	T.B.D	-	mA	Note1 Vdd=3.3V,25℃
LED Driver Power Voltage	V_{LED}	-	12	-	V	
Back-light LED Total Voltage	V_{BL}	-	22	24	V	
LED Driver Current	I_{LED}	-	0.9	-	mA	
Back-light LED Total Current	I_{BL}	-	360	-	mA	
PWM Frequency for LED Driver	LED_PWM	100	-	20	KHz	
IRush Current				T.B.D	mA	Note3.

Note1：The supply voltage is measured and specified at the interface connector of LCM.
(Test Pattern : White)

Note2：PBL is calculated value for reference.This value is without LED driver efficiency .

Note3:



3.2 Recommended Operating Conditions

Parameter				Min.	Typ	Max	Units
All Supply Voltage				3.0	3.3	3.6	V
Operating Ambient Temperature				0		70	°C
CLK Frequency	MODE<1:0>=LL Dual-in/Dual-out		LVDS Input	8		135	MHz
			Output	8		135	MHz
	MODE<1:0>=LH Dual-in/Single-out	Single Edge Output (MODE2=L)	LVDS Input	20		75	MHz
			Output	40		150	MHz
		Double Edge Output (MODE2=H)	LVDS Input	20		75	MHz
			Output	20		75	MHz
	MODE<1:0>=HL Single-in/Dual-out		LVDS Input	8		135	MHz
			Output	4		67.5	MHz
	MODE<1:0>=HH Single-in/Single-out		LVDS Input	8		135	MHz
			Output	8		135	MHz
Differential CLKIN High Time (t_{RCIH}) (Fig1)				$2\frac{t_{RCIP}}{7}$		$5\frac{t_{RCIP}}{7}$	nsec
Differential CLKIN Low Time (t_{RCIL}) (Fig1)				$2\frac{t_{RCIP}}{7}$		$5\frac{t_{RCIP}}{7}$	nsec

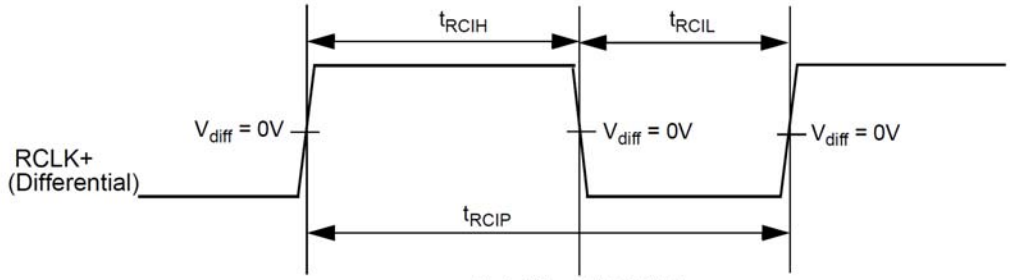


Fig1. Differential CLKIN

3.3 CMOS/TTL DC Specifications

Symbol	Parameter	Conditions	Min.	Typ	Max	Units
V_{IH}	High Level Input Voltage	/PDWN, MODE[2:0] R/F, OE, MAP Pin	2.0		V_{CC}	V
V_{IL}	Low Level Input Voltage		GND		0.8	V
V_{IH3}	High Level Input Voltage	3-Level Inputs (DK Pin)	$0.8V_{CC}$		V_{CC}	V
V_{IM3}	Middle Level Input Voltage		$0.6V_{CC}$		$0.4V_{CC}$	V
V_{IL3}	Low Level Input Voltage		GND		$0.2V_{CC}$	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
I_{IL}	Input Leakage Current	/PDWN, MODE[2:0] R/F, OE, MAP Pin $0V \le V_{IN} \le V_{CC}$			±10	μA
I_{IL3}	3-Level Input Leakage Current	3-Level Inputs (DK Pin) $0V \le V_{IN} \le V_{CC}$			±10	μA

3.4 LVDS Receiver DC Specifications

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{TH}	Differential Input High Threshold	V_{IC}= 1.2V			100	mV
V_{TL}	Differential Input Low Threshold	V_{IC}= 1.2V	-100			mV
I_{ILD}	Differential Input Leakage Current	V_{IN}= 2.4V / 0V			30	μA

3.5 Switching Characteristics

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

3.6 AC Timing Diagrams

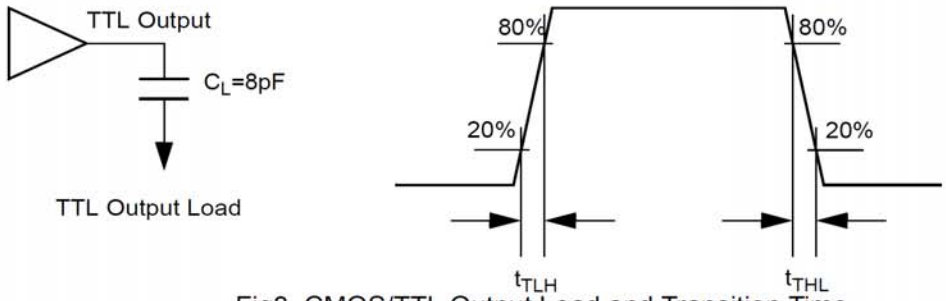


Fig3. CMOS/TTL Output Load and Transition Time

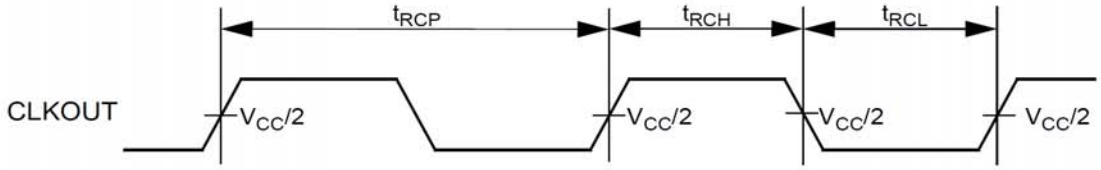


Fig4. CLKOUT Period and High/Low Time

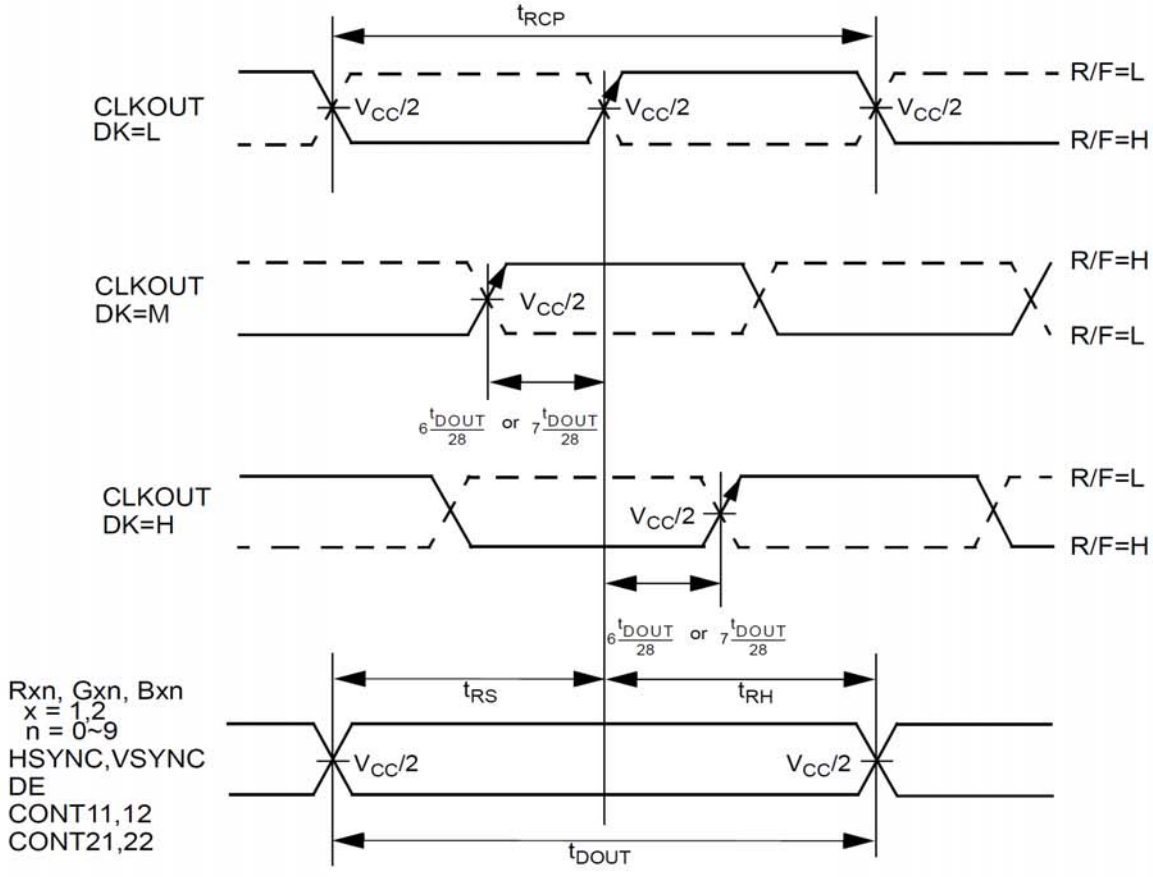


Fig5. CLKOUT Position and Setup/Hold Timing

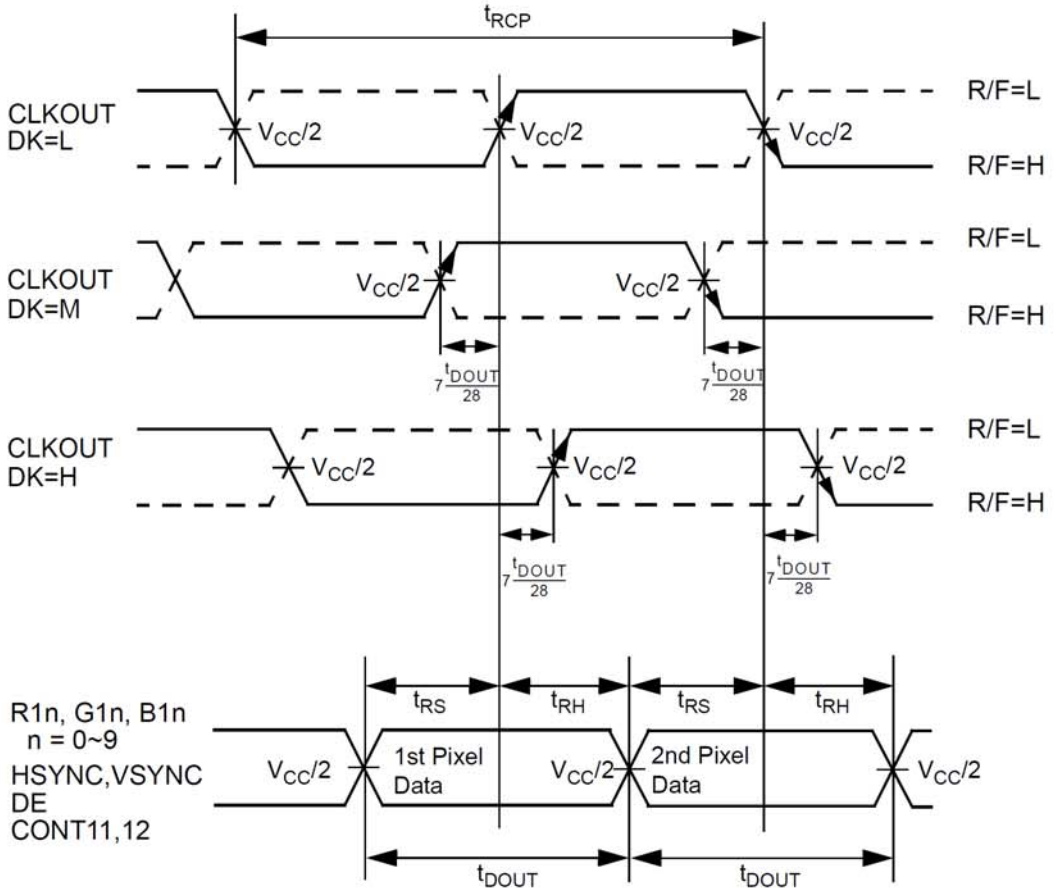


Fig6. CLKOUT Position and Setup/Hold Timing for Double Edge Output Mode
MODE<1:0>=LH, MODE2=H

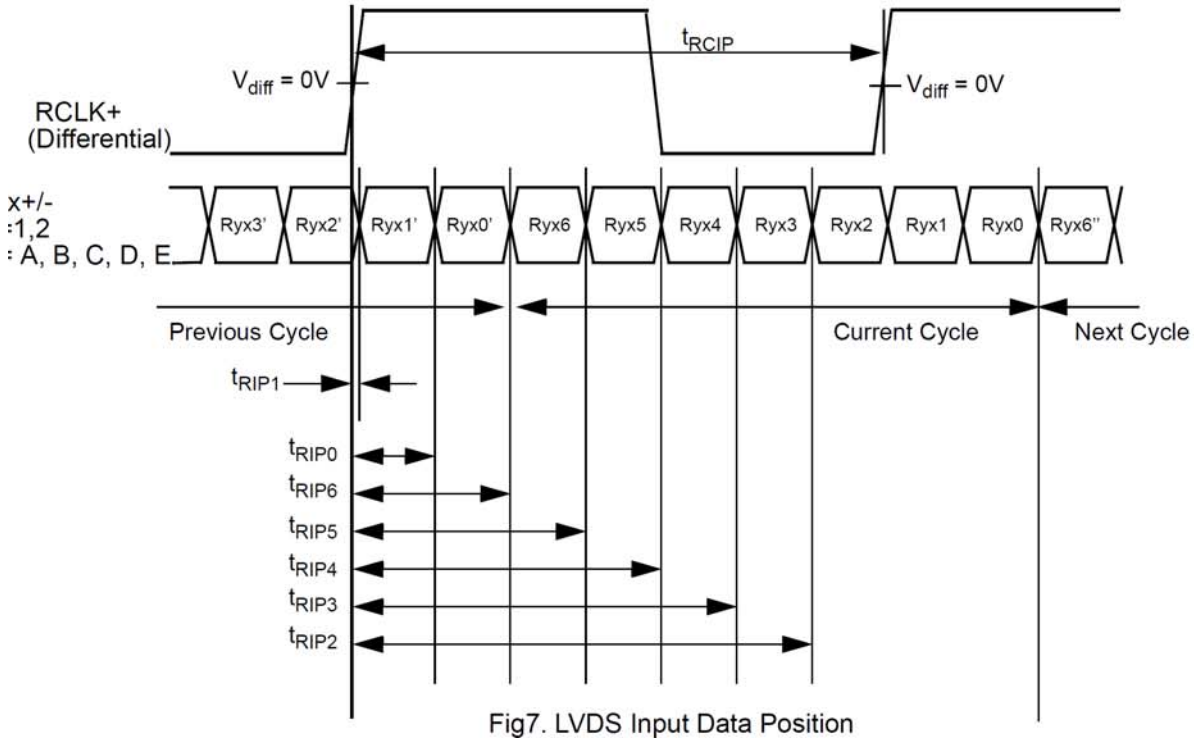


Fig7. LVDS Input Data Position

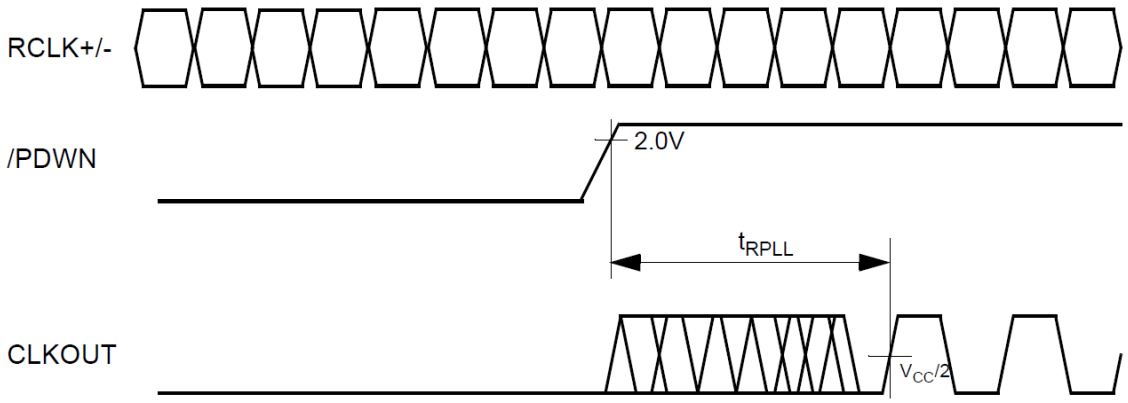


Fig8. PLL Lock Loop Set Time

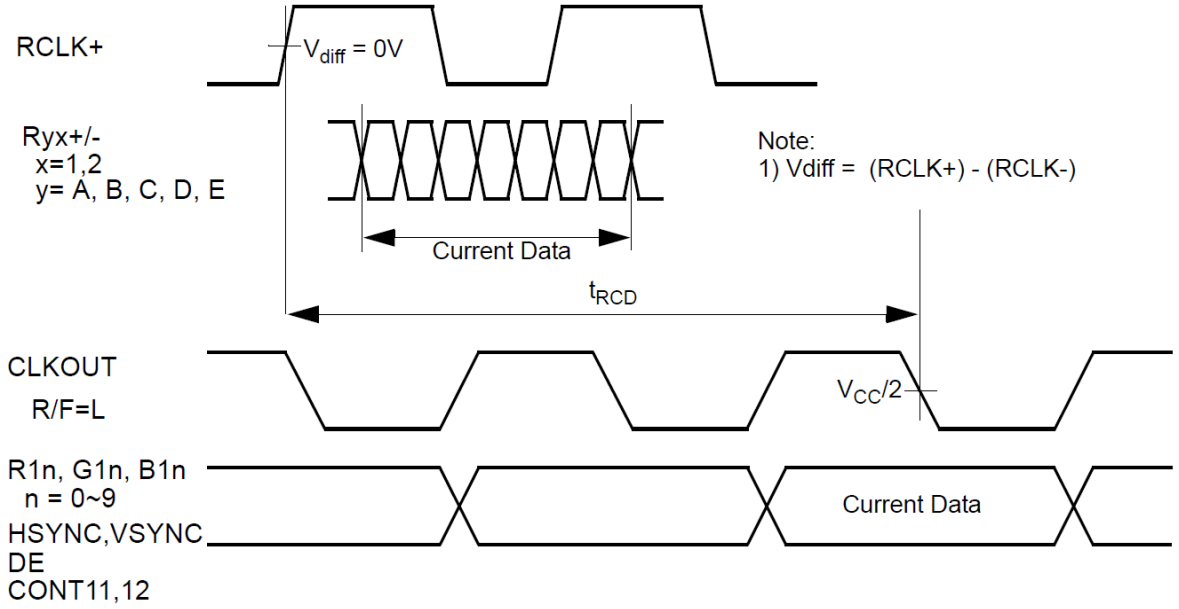


Fig9. RCLK +/- to CLK OUT Delay

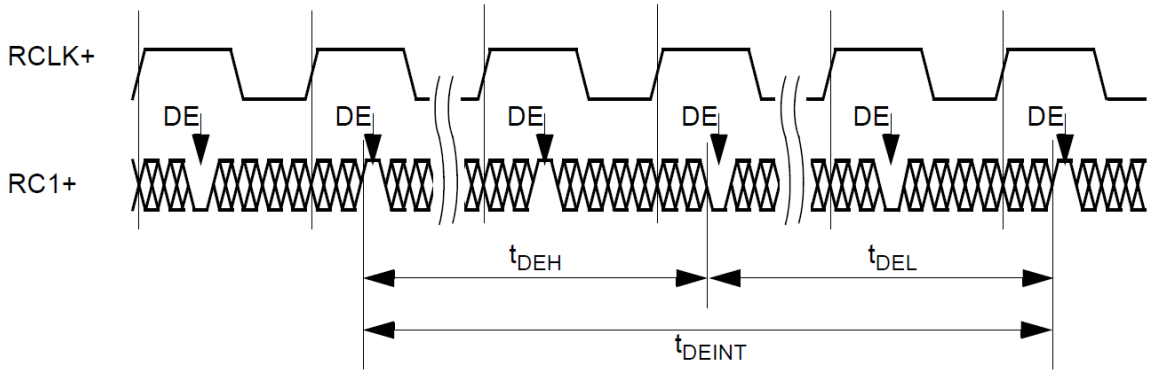


Fig9-1. Single IN / Dual OUT mode RC1(DE) input timing

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		680	850	-	cd/m^2	Note4
Luminance Uniformity	9Points		75	-	-	%	Note4
Cross Talk	CT	Θ=0	-	-	2.0	%	Note6

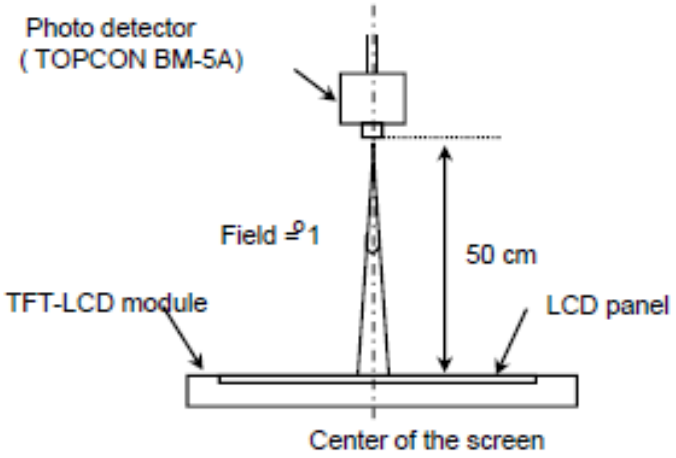
Notes 1：Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface(see Figure1).

Notes 2：Contrast measurements shall be made at viewing angle of 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 (see Figure1). Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance when displaying a white raster / 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,

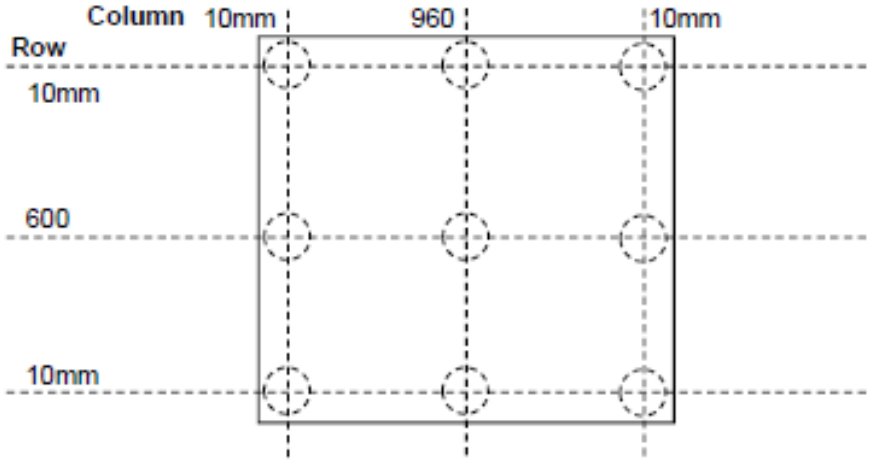
blue and white. Measurements shall be made at the center of the panel.

Figure 1. Measurement Set Up



Optical characteristics measurement setup

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

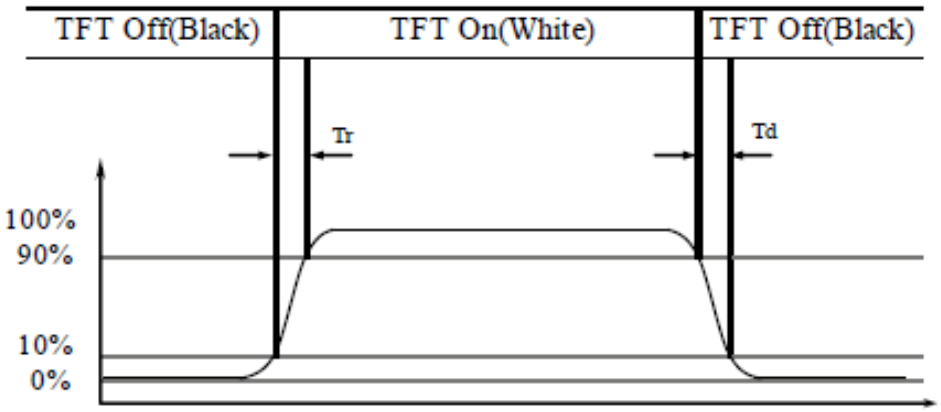


Note 4.

Luminance of white is defined as luminance values of 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.

•Yw = (Sum of 9 Points Luminance / 9)
•ΔY9 = (Min Luminance of 9points /Max luminance of 9 point) * 100%
* LED Condition = (Duty Ratio 100%, LED current 20.0mA)

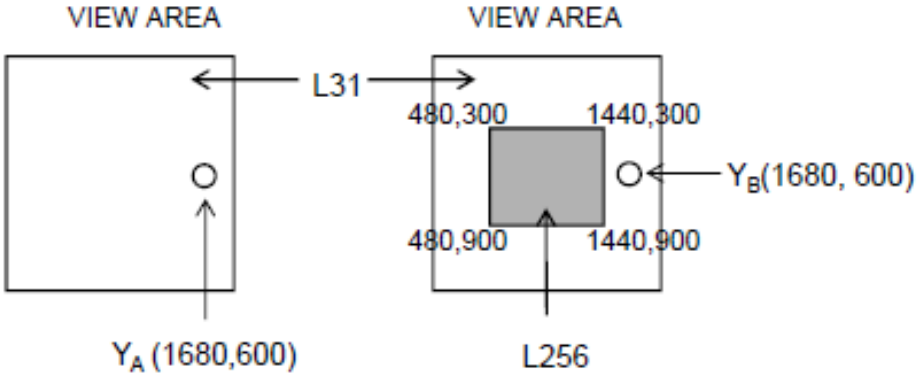
Figure 3. Response Time Testing



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 Tr, and 90% to 10% is Td.

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



$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_B} \right| \times 100$$

Where:

Y_A = Initial luminance of measured area (cd/m^2)
Y_B = Subsequent luminance of measured area (cd/m^2)
The location measured will be exactly the same in both patterns

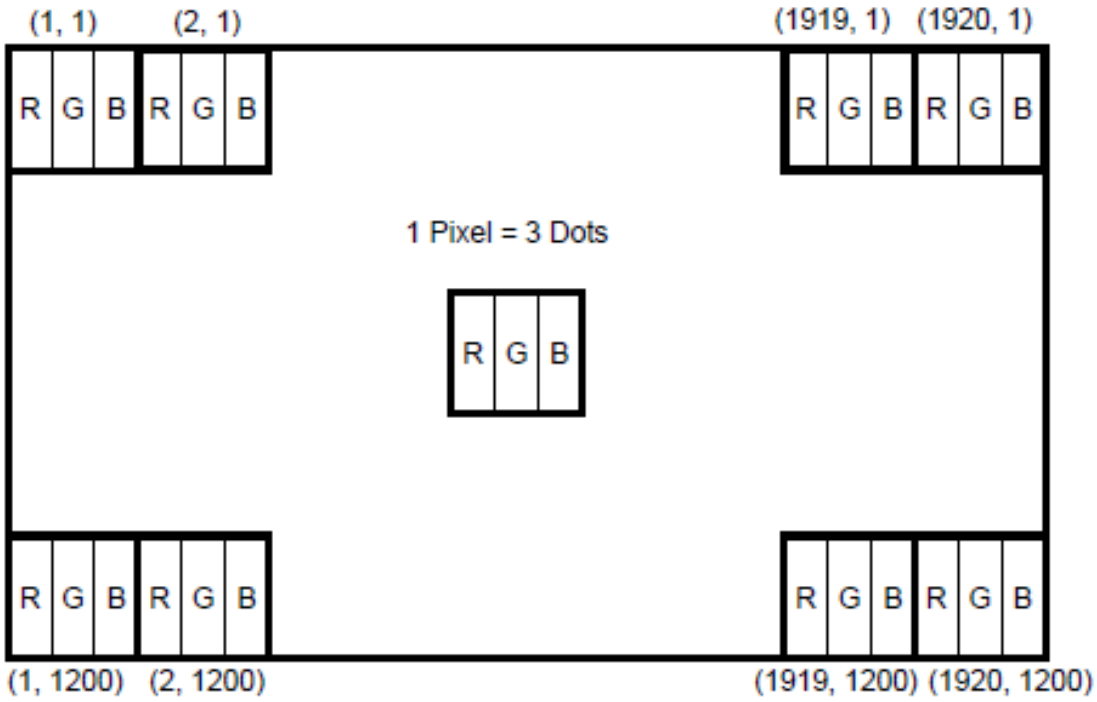
5.0 Interface Connections

5.1 Electrical Interface Connection

Pin #	Singnal 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	E_CLK-	-LVDS differential data input
27	E_CLK+	+LVDS differential data input
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 (12V)
33	VLED	LED Power Supply (12V)
34	VLED	LED Power Supply (12V)
35	VLED	LED Power Supply (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

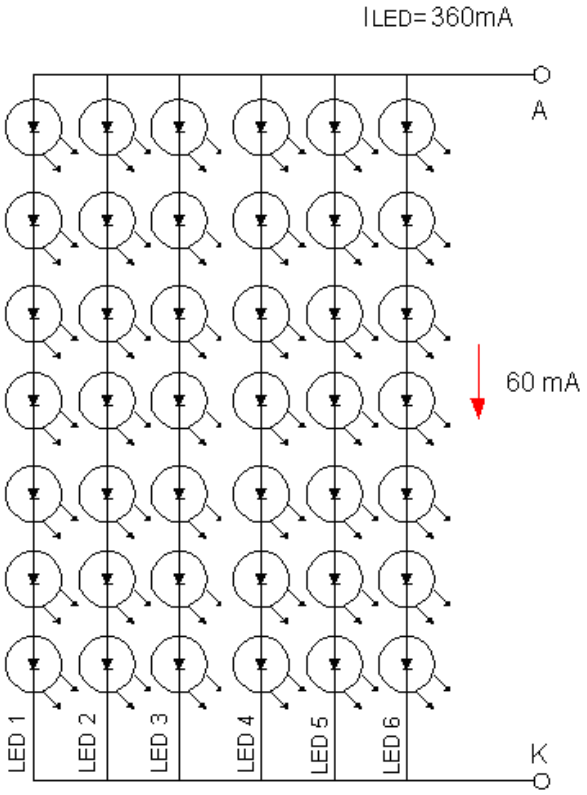


6. LED Driving Conditions

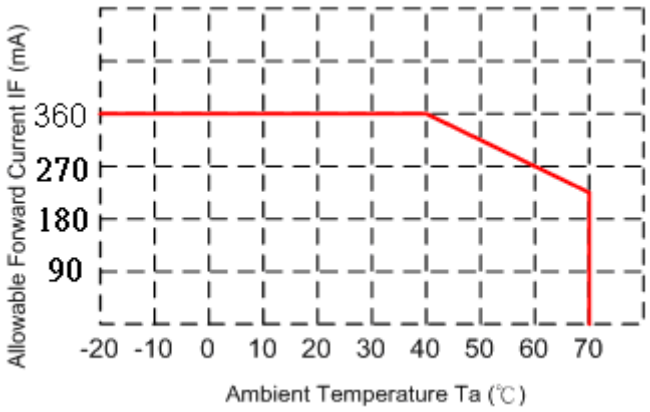
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
LED Backlight Voltage	V_{BL}	--	22	24	V	For reference
LED Backlight Current	I_{BL}	-	360	--	mA	**Ta=25℃**
LED Life Time		--	50K	-	KHr	Note*

Note* : Brightness to be decreased to 50% of the initial value.

Ta=25℃



When LCM is operated over 40℃ ambient temperature, the ILED should be follow :



7. Projected capacitive-type Touch panel specification

7.1 Basic Characteristic

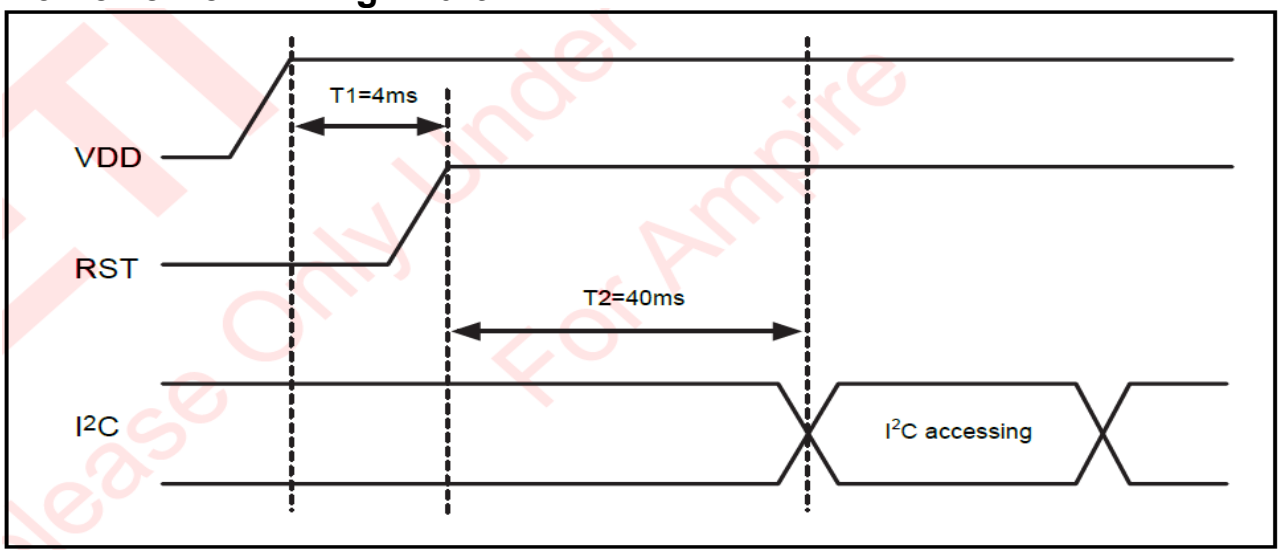
ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Two-fingers or Signal-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx 100 points/sec
Control IC	**EETI EXC3000**

Item	Symbol	Min.	Typ.	Max.	Unit
Power Supply Voltage	VDD	4.75	5	5.25	V
Low Level Input Voltage	VIL	0	--	0.8	V
High Level Input Voltage	VIH	0.8*VIN	--	VIN	V

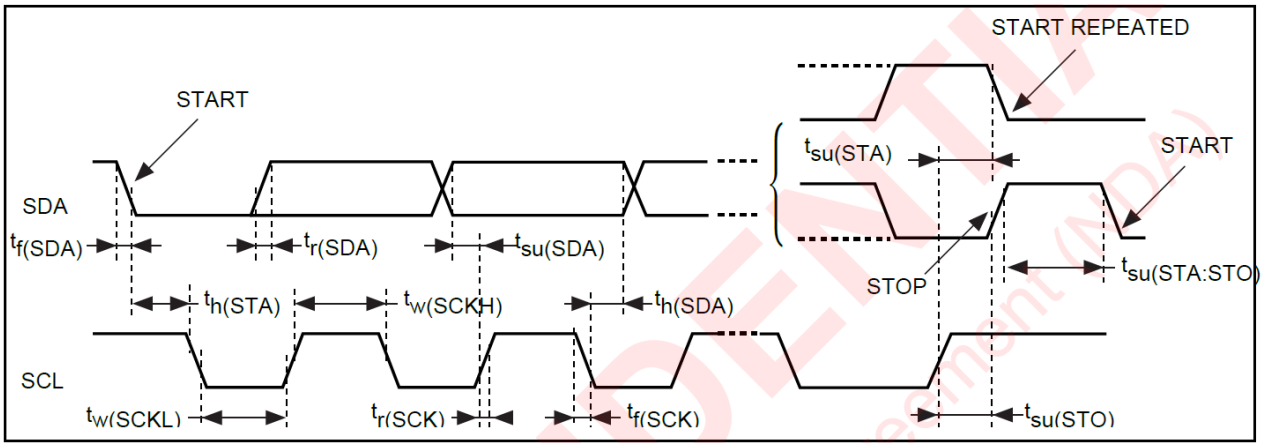
7.2 Interface

CN6		
Pin No.	**Symbol**	**Function**
1	VDD	Power Supply for TP controller
2	SCL	I2C Data
3	SDA	I2C Clock
4	/INT	Interrupt Request pin
5	RES	Rest pin to Master Chip
6	GND	GND

7.3 Power- on Timing Chart



7.4 I2C AC Waveform



I2C Characteristics

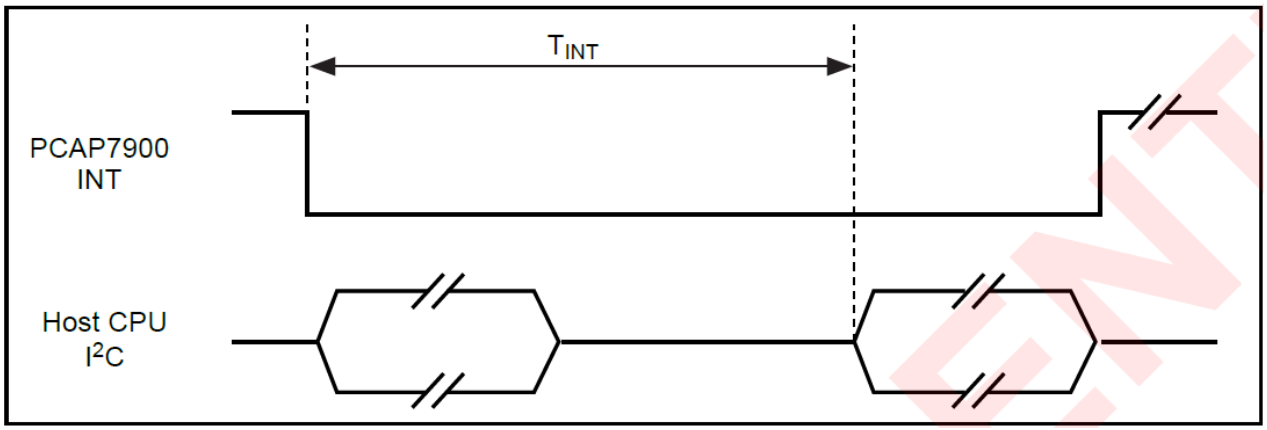
Symbol	Parameter	SCL = 100KHz		SCL = 400KHz		Unit
		Min	Max	Min	Max	
$t_{w(SCLH)}$	SCL clock high time	4.7		1.3		μs
$t_{w(SCLL)}$	SCL clock low time	4.0		0.6		
$t_{su(SDA)}$	SDA setup time	250		100		ns
$t_{h(SDA)}$	SDA data hold time	0		0	900	
$t_{r(SDA)}$ $t_{r(SCL)}$	SDA and SCL rise time		1000		300	
$t_{f(SDA)}$ $t_{f(SCL)}$	SDA and SCL fall time		300		300	
$t_{h(STA)}$	Start condition hold time	4.0		0.6		μs
$t_{su(STA)}$	Repeated Start condition setup time	4.7		0.6		
$t_{su(STO)}$	Stop condition setup time	4.0		0.6		μs
$t_{w(STO:STA)}$	Stop to Start condition time (bus free)	4.7		1.3		μs

7.5 Software Protocol

I2C Transaction Frame: each I2C transaction frame transfers one I2C packet data.

The IRQ pin is low level trigger.

The controller will pulls IRQ pin low until no data in the controller buffer.



Report rate = 1 / TINT , it depends on properties of touch screen such as resistive value, I2C clock rate, channel number, thickness and material of cover lens, etc.

For better touch performance, we strongly recommend using the 400K clock rate.

	From Host to Device
	From Device to Host

S = START condition
Sr = Repeat START condition
P = STOP condition
R = Data direction READ (SDA HIGH)
W = Data direction WRITE (SDA LOW)
Ack = Acknowledge (SDA LOW)
Nak = Not acknowledge (SDA HIGH)
Address = 7-bit (0x2A)
DATA = 8-bit

Read mode : Host-receiver, Device-transmitter.

S	Address	R	Ack	Len-LSB	Ack	Len-MSB	Ack	DATA	Ack
DATA	Ack				DATA	Nak	P		

Host need to read 66 Bytes for input report retrieval. The total 66 Bytes contains 2 Bytes “Length” and 64 Bytes data payload. The value of “Len” is calculated by 2 Bytes for “Len” field and n Bytes for valid “Input Data” in the payload.

The input data packet format inside the I2C payload is defined as

Report ID	Data

According to different report ID, there are different data format as below.
Report ID = 6, for parallel mode multi-touch data.

Multi-Touch format :

Byte0	Byte1
Report ID = 0x06	Num Of Fingers*

Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9	Byte10	Byte11
Contact data 1									
Byte12	Byte13	Byte14	Byte15	Byte16	Byte17	Byte18	Byte19	Byte20	Byte21
Contact data 2									
Byte22	Byte23	Byte24	Byte25	Byte26	Byte27	Byte28	Byte29	Byte30	Byte31
Contact data 3									
Byte32	Byte33	Byte34	Byte35	Byte36	Byte37	Byte38	Byte39	Byte40	Byte41
Contact data 4									
Byte42	Byte43	Byte44	Byte45	Byte46	Byte47	Byte48	Byte49	Byte50	Byte51
Contact data 5									

Byte52	Byte53	Byte54	Byte55
Scan Time			

The device input report contains maximum 5 contacts in one I2C frame. If it must report 10 contacts, device will break these down into 2 I2C frames that report 5 contacts each. The “Nums of Fingers” indicates the actual contact in this report. The actual contact number is reported in the first frame. The other frames should have an actual count of 0. For 10 contacts example, the actual count in the first frame has a value of 10, and the second frame has an actual count of 0.

Contact data format :

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
State**	Finger ID	X *** (LSB)	X (MSB)	Y *** (LSB)	Y (MSB)	reserved		reserved	

** tate: Bit0=Down/Up bit, Bit0 = 1 for Touch Down, Bit0 = 0 for Lift off.

*** The X/Y resolution is 4096.

Report ID = 3, for vendor specific diagnostics data.

Diagnostics packet format

Byte0	Byte1	≈
Report ID = 0x03	Length	data stream

The “Length” indicates the length of the coming data stream. This data stream must follow EETI eGalax diagnostics format. The software integrator must be carefully handling this data stream.

S	Address	W	Ack	0x67	Ack	0x00	Ack		
	Len-LSB		Ack	Len-MSB	Ack	DATA	Ack	DATA	Ack
	DATA		Ack	≈		DATA	Ack	P	

Write mode : Host-transmitter, Device-receiver.

Host need to write 2 Bytes [0x67] [0x00] to device first, and follow 2 Bytes length field and data payload. Each I2C transaction always contains 64 Bytes data payload so the length field should be always as 66 Bytes (2 Bytes for “Len”+64 Bytes for “Data” payload).If the data to be sent to the controller is less than 64 Bytes, 0 padding is necessary.

The packet format in the payload is defined as diagnostics packet.

Diagnostics packet format :

Byte0	Byte1	≈
Report ID = 0x03	Length	data stream

The “Length” indicates the length of the coming data stream. This data stream must follow EETI eGalax diagnostics format. The software integrator must be carefully handling this data stream.

7.6 Command Example

Query firmware version

Host → Device

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
0x67	0x00	0x42	0x00	0x03	0x01	'D'	0x00	0x00	0x00
Byte10 → Byte67									
0x00									

⬇

<Device triggers INT pin low. Host call the read function to retrieve the device response data>

⬇

Device → Host

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
0x42	0x00	0x03	0x07	'D'	'0'	'.'	'0'	'0'	'2'
Byte10	Byte11 → Byte65								
0x00	0x00								

Host → Device

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
0x67	0x00	0x42	0x00	0x03	0x01	'E'	0x00	0x00	0x00
Byte10 → Byte67									
0x00									

⬇

<Device triggers INT pin low. Host call the read function to retrieve the device response data>

⬇

Device → Host

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
0x42	0x00	0x03	0x0C	'E'	'P'	'7'	'9'	'0'	'0'
Byte10	Byte11	Byte12	Byte13	Byte14	BYTE15	Byte16 → Byte65			
'-'	PID				0x00	0x00			

⬇

Note: Byte[11:14] = 001A stands for model PID 001A

Query controller model name

7.7 Power Saving Mechanism

EXC7900 - supports 3 working mode for power saving.

Fully working mode :

After reset, the controller module works at full power working state.

Idle mode:

After EXC7900 receives a software packet from host computer to request MCU entering idle state, this controller module will enter idle state. At idle state, IRQ pin will be released to high state. Host computer can wake up this controller module via generating a falling edge signal at IRQ pin. When controller transfers to fully working mode, it will reply a wakeup command to host.

Set idle command

Host → Device

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
0x67	0x00	0x42	0x00	0x03	0x04	0x36	0x3F	0x01	T
Byte10 → Byte67									
0x00									

Host computer send this command as above for idle state configuration setting. Where, T means the scanning interval when in idle state. The touch controller will wakeup every that period of time to scan touch screen to check if the touchscreen touched or not. Once it detects sensor touched, the controller will back to fully working state automatically.

⬇

The default value of T is 30, the interval = T x 0.25 = 7.5ms

Sleep mode:

Whenever the host computer wants to deep sleep, it issues a sleep command packet to controller. Once the controller firmware receives such sleep command, it enters deep sleep state and does not response until it wakes up from this sleep state. Only host computer can wake up this device via generating a falling edge signal at IRQ pin.
When controller transfers to fully working mode, it will reply a wakeup command to host.

Set sleep command

Host → Device

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
0x67	0x00	0x42	0x00	0x03	0x03	0x36	0x3F	0x02	0x00
Byte10 → Byte67									
0x00									

Host computer send above command packet to touch controller device to make the device enter sleep state for power saving.

Wakeup notification command

Once the controller transfers to working state from idle and sleep state, it will trigger INT pin low and reply below command to host.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9
0x42	0x00	0x03	0x03	0x36	0x3F	0x01	0x00	0x00	0x00
Byte10 → Byte65									
0x00									

8. Reliability Test

The Reliability test items and its conditions are shown in below.

Items	Required Condition	Note
Temperature Humidity Bias	Ta=60℃, 90%RH, 300h	
High Temperature Operation	Ta= 70℃, Dry, 300h	
Low Temperature Operation	Ta= -20℃, 300h	
High Temperature Storage	Ta=80℃, 300h	
Low Temperature Storage	Ta= -30℃, 300h	
Thermal Shock Test	Ta=-20℃to 60℃, Duration at 30 min, 100 cycles	

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.

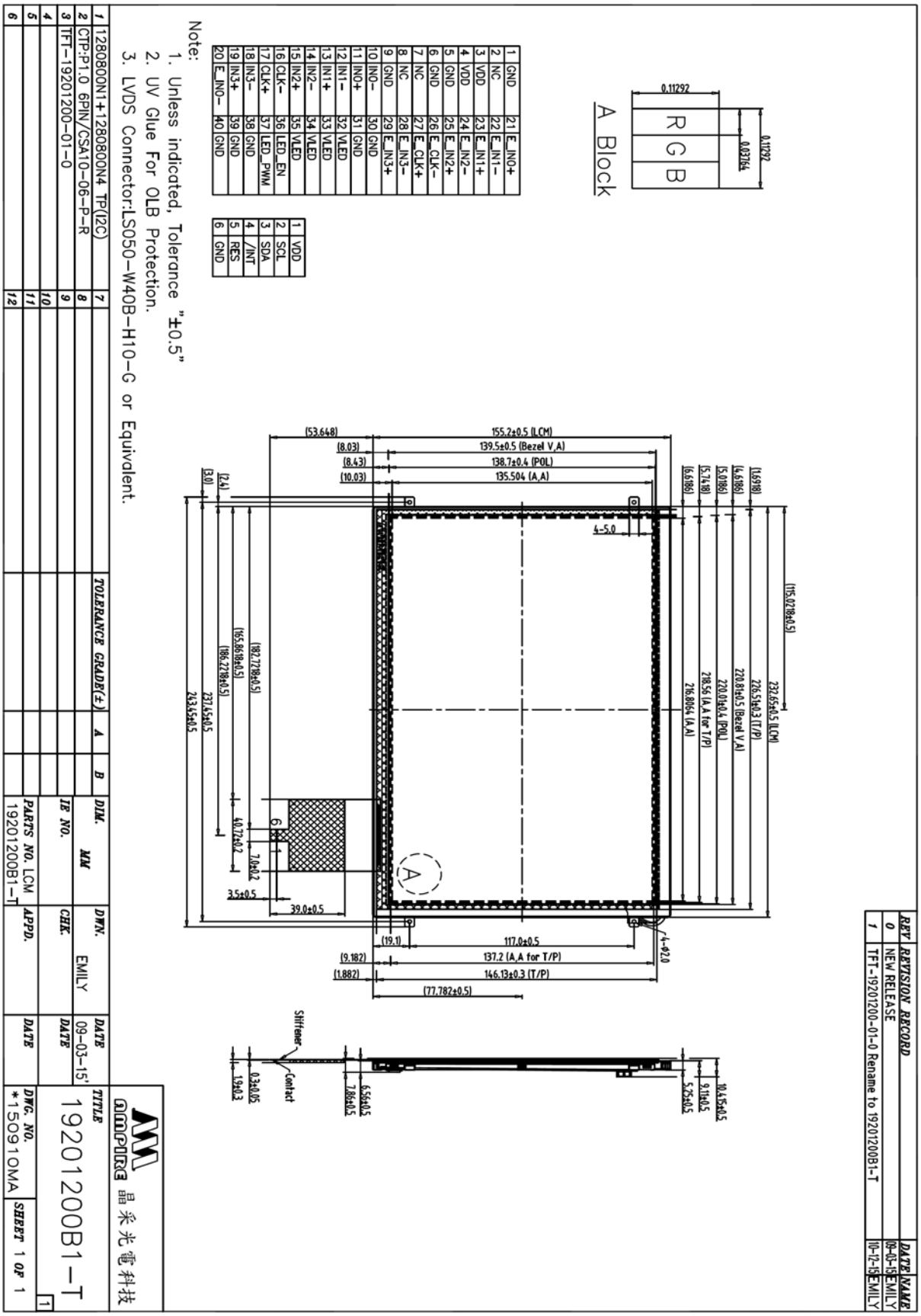
9.10 Disposal

When disposing LCD module, obey the local environmental regulations.

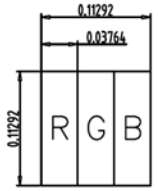
9.11 Others

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.

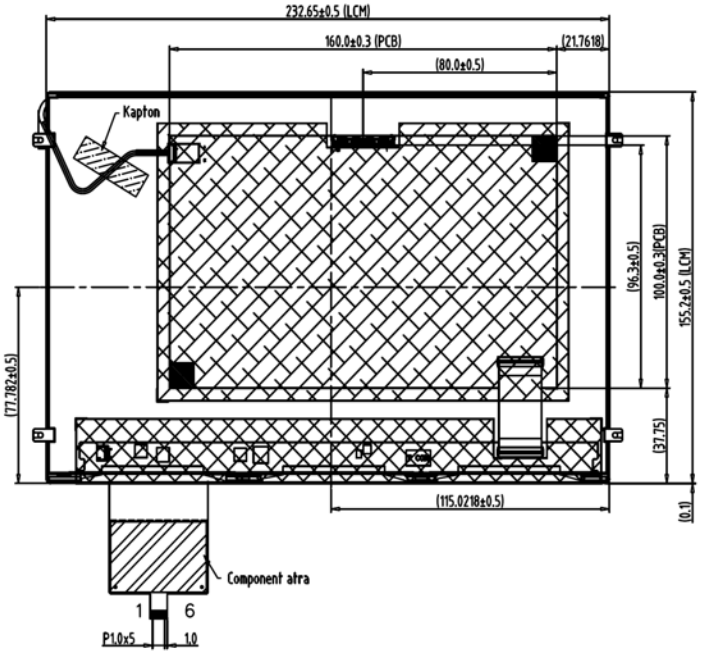
10. Outline Dimension



REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	09-03-15	EMILY
1	TFT-19201200-01-0 Rename to 19201200B1-T	10-12-15	EMILY



A Block



Back View

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	E_CLK−
7	NC	27	E_CLK+
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	VDD
2	SCL
3	SDA
4	/INT
5	RES
6	GND

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

1	1280800N1+1280800N4 TP(I2C)	7		TOLERANCE GRADE(±)	A	B	DIM. MM	DWN. EMILY	DATE 09-03-15'	TITLE 19201200B1−T
2	CTP:P1.0 6PIN/CSA10−06−P−R	8					IE NO.	CHK.	DATE	1
3	TFT−19201200−01−0	9								
4		10								
5		11					PARTS NO. LCM−1 19201200B1−T	APPD.	DATE	DWG. NO. *150911MA SHEET 1 OF 1
6		12								

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AMPIRE CO., LTD.

Date : 2015/11/26