



A Professional Manufacturer of Display

Manufacturer Certificated



CERT. No.: 282Q19070712006



CERT. No.: 282E19070712007

Product Specification

Model: TTY238XHT-02

23.8" TFT Display Module(1920*1080)

This module uses RoHS material

Tailor Pixels Technology Co., Ltd.

www.tailorpixels.com

tailor@tailorpixels.com

Ph: 86-755-8821 2653

Contents in this document are subject to change without notice. No part of this document can be reproduced or transmitted by any means for any purpose without the written permission of Tailor Pixels Technology Co., Ltd.

REVISION HISTORY

[illegible]

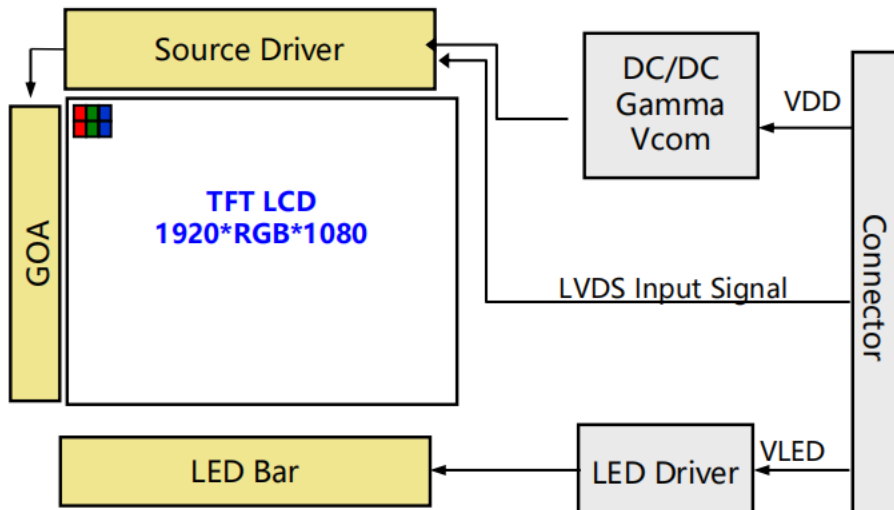
Contents

No.	Items	Page
1.0	General Description	4
2.0	Absolute Maximum ratings	6
3.0	Electrical specifications.	7
4.0	Interface Connection	8
5.0	Signal Timing Specifications	10
6.0	Signal Timing Waveforms Of Interface Signal	12
7.0	INPUT SIGNALS,BASIC DISPLAY COLORS & GRAY SCALE OF COLORS	14
8.0	POWER SEQUENCE	15
9.0	Optical specifications.	16
10.0	Backlight	19
11.0	Mechanical Outline Dimension	20
12.0	Reliability Test	21

1.0 GENERAL DESCRIPTION

1.0.1 Introduction

TTY238XHT-02 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 238 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



1.0.2 Features

- LED back-light
- LVDS interface
- RoHS Compliant
- 16.7M color depth

1.0.3 Application

- Video Phone/IP Phone/Smart Key/ e-cigarettes etc.

1.0.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	527.04(H) × 296.46(V)	mm	
Number of pixels	1920(H) × 1080(V)	Pixels	
Pixel pitch	0.2745 (H) × 0.2745(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7 M	Colors	6bit+2FRC
Display mode	Normally Black		
Dimensional outline	544.8 (H) × 320.5 (V) × 11.5(D) Typ.	mm	
Weight	TBD	g	
Surface treatment	Haze 25% , 3H		

2.0 ABSOLUTE MAXIMUM RATINGS

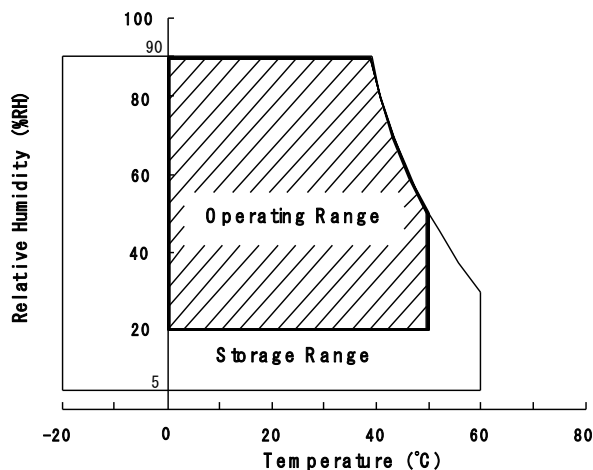
The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Environment Absolute Maximum Ratings> [Ta =25±2 °C]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	-0.3	6.0	V	Ta = 25 °C
Logic Supply Voltage	V _{IN}	VSS-0.3	VDD+0.3	V	
Operating Temperature	T _{OP}	-20	70	°C	
Storage Humidity	T _{ST}	-30	80	°C	
Heat Release Requirement	Trls	15		°C	Note3 仅适用于Q/Sin gle/FOG出货项 目

Note:

1. Temperature and relative humidity range are shown in the figure below
Wet bulb temperature should be 39 °C max. and no condensation of water.
2. Panel Surface Temperature should be Min. 0°C and Max. +65°C under the VDD = 5.0V,
Frame rate = 60Hz,25°C ambient Temp. no humidity control and LED string current is
typical value



3.0 ELECTRICAL SPECIFICATIONS

3.0.1 TFT LCD Module

< Table 3. Electrical Specifications >

[Ta =25±2 °C]

Parameter	Symbol	Value			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V _{DD}	4.5	5.0	5.5	V	Note 1,待产品 产出后实测
Power Supply Current	I _{DD}	-	TBD	TBD	mA	
	I _{DD Max}	-	TBD	TBD		
In-Rush Current	I _{RUSH}	-	TBD	TBD	A	Note 2,待产品 产出后实测
Permissible Input Ripple Voltage	V _{RF}	-	-	300	mV	Note1
High Level Differential Input Threshold Voltage	V _{IH}	-	-	+100	mV	
Low Level Differential Input Threshold Voltage	V _{IL}	-100	-	-	mV	
Differential input voltage	V _{ID}	200	-	600	mV	
Differential input voltage	V _{ID}	200	-	600	mV	
Power Consumption	P _{Typ.}	-	TBD	TBD	W	Note 1
	P _{Max}	-	TBD	TBD	W	

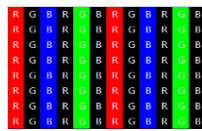
Notes : 1.The supply voltage is measured and specified at the interface connector of LCM
The current draw and power consumption specified is for VDD=5.0V.

a) Typ : Color Bar pattern, Frame rate = 60Hz

b) Max : Vertical Subline pattern,Frame rate = 75Hz



a) Typ : Color bar



b) Max : Vertical SubLine 255

4.0 INTERFACE CONNECTION.

4.0.1 Electrical Interface Connection

The electronics interface connector is LS1030-L4005W480H225-E02.

<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	RX00-	Negative Transmission data of Pixel 0 (ODD)
2	RX00+	Positive Transmission data of Pixel 0 (ODD)
3	RX01-	Negative Transmission data of Pixel 1 (ODD)
4	RX01+	Positive Transmission data of Pixel 1 (ODD)
5	RX02-	Negative Transmission data of Pixel 2 (ODD)
6	RX02+	Positive Transmission data of Pixel 2 (ODD)
7	BIST	2.5V BIST ON : Ground/NC BIST OFF
8	RXOC-	Negative Transmission Clock (ODD)
9	RXOC+	Positive Transmission Clock (ODD)
10	RX03-	Negative Transmission data of Pixel 3 (ODD)
11	RX03+	Positive Transmission data of Pixel 3 (ODD)
12	RXE0-	Negative Transmission data of Pixel 0 (EVEN)
13	RXE0+	Positive Transmission data of Pixel 0 (EVEN)
14	GND	Power Ground
15	RXE1-	Negative Transmission data of Pixel 1 (EVEN)
16	RXE1+	Positive Transmission data of Pixel 1 (EVEN)
17	GND	Power Ground
18	RXE2-	Negative Transmission data of Pixel 2 (EVEN)
19	RXE2+	Positive Transmission data of Pixel 2 (EVEN)
20	RXEC-	Negative Transmission Clock (EVEN)
21	RXEC+	Positive Transmission Clock (EVEN)
22	RXE3-	Negative Transmission data of Pixel 3 (EVEN)
23	RXE3+	Positive Transmission data of Pixel 3 (EVEN)
24	GND	Power Ground
25	SCL	NC(No Connect, Internal use)
26	SDA	NC(No Connect, Internal use)
27	NC	No. Connection
28	VDD	Power Supply : +5V
29	VDD	
30	VDD	

4.0.2 LVDS Interface (Tx; THC63LVDF83A or Equivalent)

	Input Signal	Transmitter		Interface		MV238FHM-N60 (CN11)	Remark
		Pin No.	Pin No.	System (Tx)	TFT-LCD (Rx)	Pin No.	
L V D S	OR0	51	48 47	OUT0- OUT0+	RXO0- RXO0+	1 2	
	OR1	52					
	OR2	54					
	OR3	55					
	OR4	56					
	OR5	3					
	OG0	4					
	OG1	6	46 45	OUT1- OUT1+	RXO1- RXO1+	3 4	
	OG2	7					
	OG3	11					
	OG4	12					
	OG5	14					
	OB0	15					
	OB1	19					
	OB2	20	42 41	OUT2- OUT2+	RXO2- RXO2+	5 6	
	OB3	22					
	OB4	23					
	OB5	24					
	Hsync	27					
	Vsync	28					
	DE	30					
	MCLK	31	40 39	CLK OUT- CLK OUT+	RXO CLK- RXO CLK+	8 9	
	OR6	50	38 37	OUT3- OUT3+	RXO3- RXO3+	10 11	
	OR7	2					
	OG6	8					
	OG7	10					
	OB6	16					
	OB7	18					
	RSVD	25					

Note: The order of even data is same with odd data.

5.0 SIGNAL TIMING SPECIFICATION

5.0.1 The TTY238XHT-02 is operated by the DE only.

Item	Symbols		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	-	13.47	-	ns	
	Frequency	-	-	74.25	-	MHz	
Hsync	Period	tHP	-	1100	-	tCLK	
	Horizontal Valid	tHV	-	960	-	tCLK	
	Horizontal Blank	tHB	-	140	-	tCLK	
	Frequency	fH	-	67.5	-	KHz	
Vsync	Period	tVP	-	1125	-	tHP	Note 1
	Vertical Valid	tVV	-	1080	-	tHP	
	Vertical Blank	tVB	-	45	-	tHP	
	Frequency	fV	-	60	-	Hz	Note 2
LVDS Receiver clock	Input spread spectrum ratio	SSr	-3	-	+3	%	

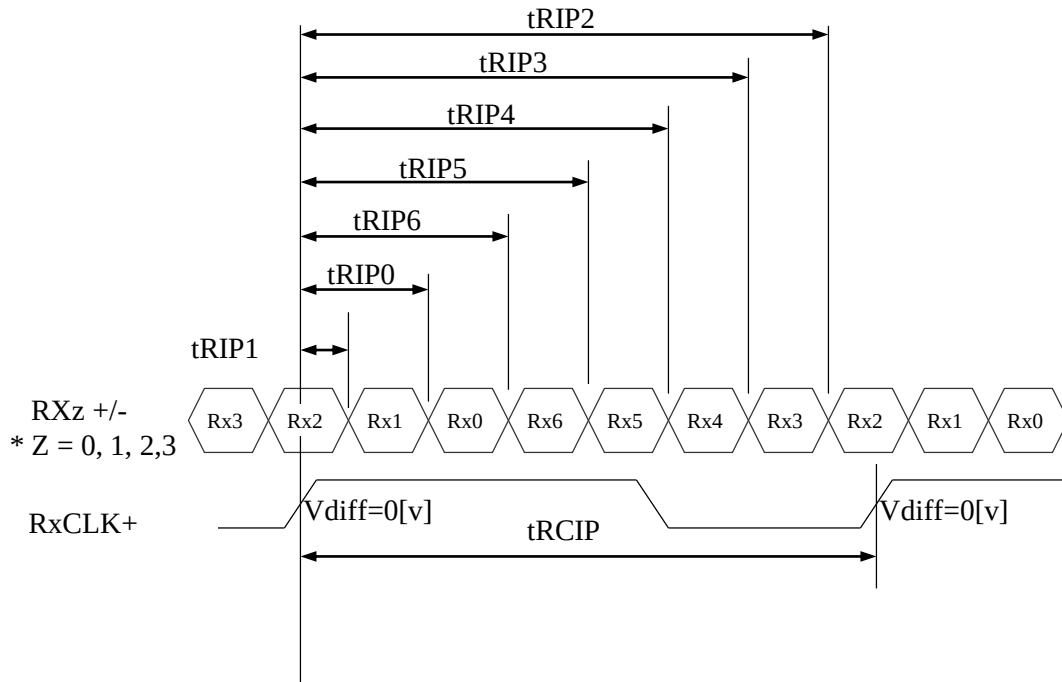
Note: The DCLK range at last line of V-blanking should be set in 0-H-active/2.

5.02 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 4.

<Table 4. LVDS Rx Interface Timing Specification>

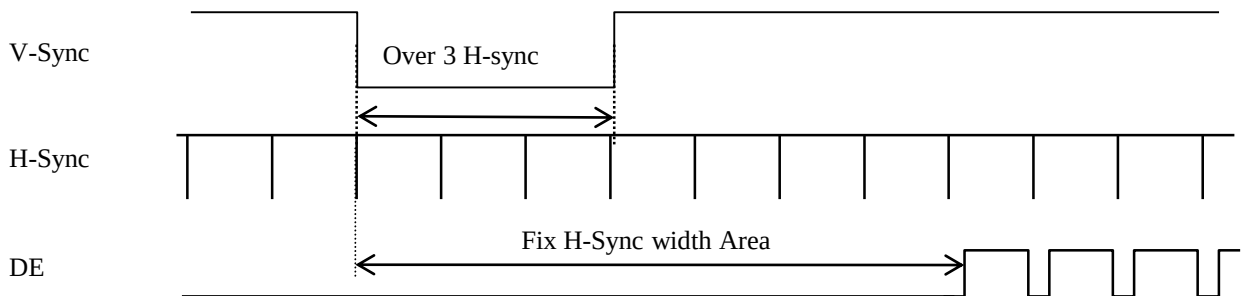
Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	14.81	18.52	22.22	nsec	
Input Data 0	tRIP1	-0.4	0.0	+0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 × tRCIP/7-0.4	2 × tRCIP/7	2 × tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 × tRCIP/7-0.4	3 × tRCIP/7	3 × tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 × tRCIP/7-0.4	4 × tRCIP/7	4 × tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5 × tRCIP/7-0.4	5 × tRCIP/7	5 × tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6 × tRCIP/7-0.4	6 × tRCIP/7	6 × tRCIP/7+0.4	nsec	



$$* V_{diff} = (RXz+) - (RXz-), \dots, (RXCLK+) - (RXCLK-)$$

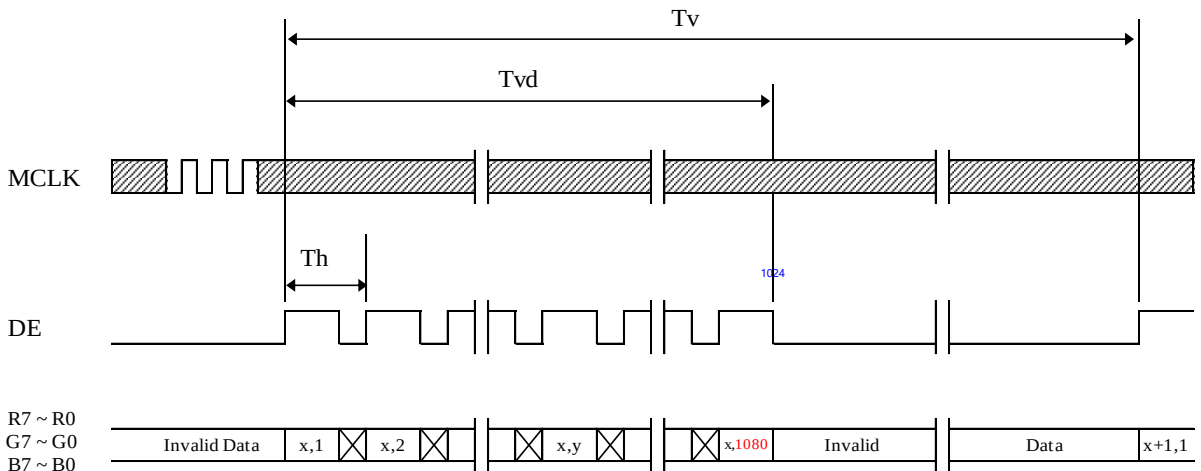
6. SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

6.01 Sync Timing Waveforms

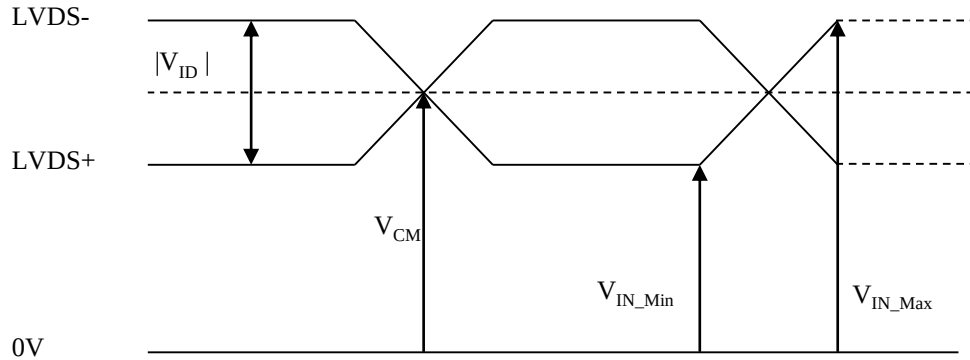


- 1) Need over 3 H-sync during V-Sync Low
- 2) Fix H-Sync width from V-Sync falling edge to first rising edge

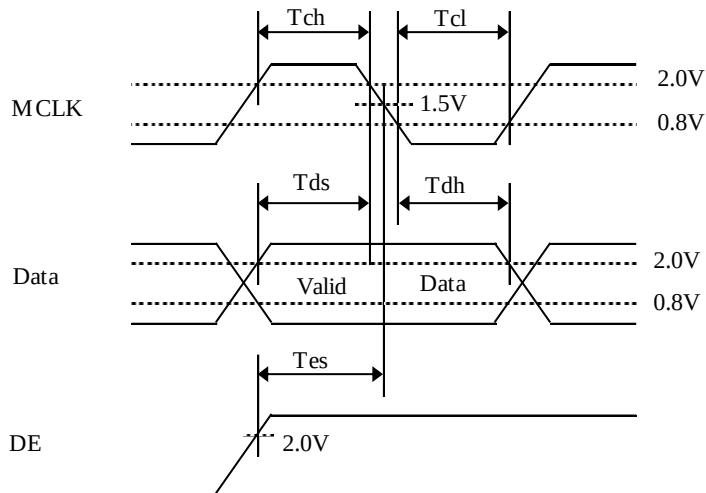
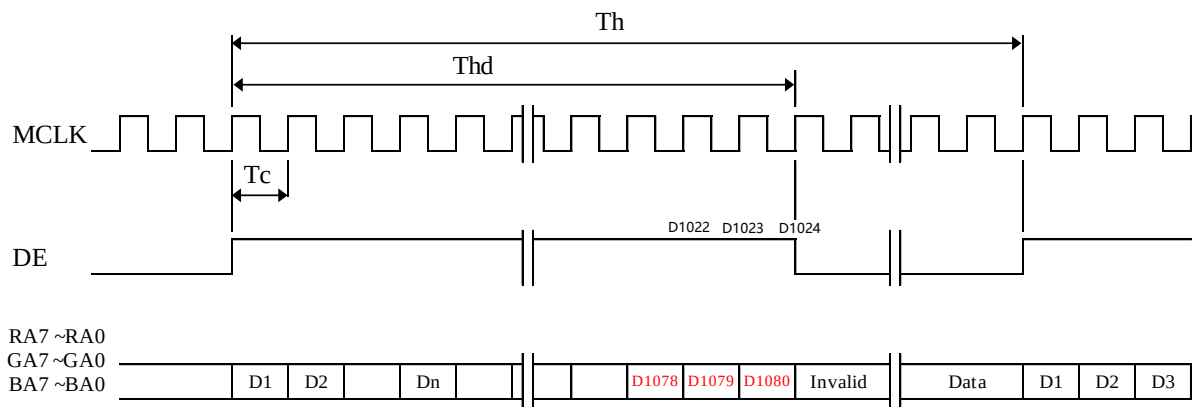
6.02 Vertical Timing Waveforms



6.03 Horizontal Timing Waveforms



Differential input voltage	$ V_{ID} $	200	-	600	mV
Differential input common mode voltage	V_{CM}	1.0	1.2	1.5	V

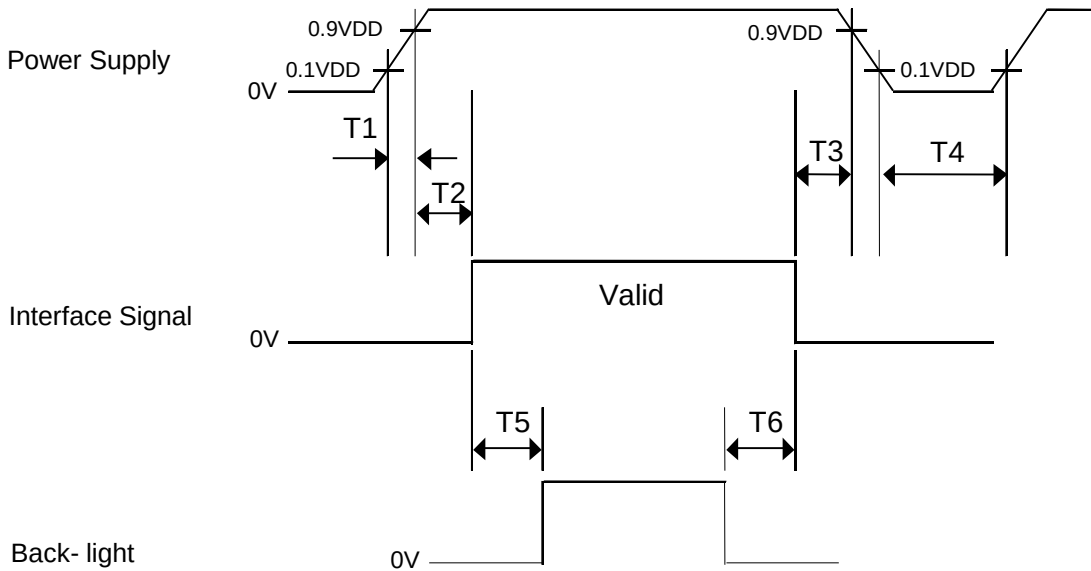


7.0 INPUT SIGNALS,BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

Color & Gray Scale																									
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	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	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	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	0
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	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	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	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of WHITE	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	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	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	1	1	1	1	1	1

8.0 POWER SEQUENCE(初版时序，正式版需要实测)

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



- $0.5 \text{ ms} \leq T1 \leq 10 \text{ ms}$
- $0 \leq T2 \leq 50 \text{ ms}$
- $0 < T3 \leq 50 \text{ ms}$
- $1 \text{ sec} \leq T4$
- $200 \text{ ms} \leq T5$
- $200 \text{ ms} \leq T6$

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.
4. T7 decreases smoothly, there is none re-bouncing voltage.
5. If T3=0ms, there is a risk of flicker when power On/Off.
6. If T6=0ms, there is a risk of abnormal display when power off.

9.0 OPTICAL SPECIFICATION

9.0.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance $\leq 1\text{lux}$ and temperature = $25\pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON CS2000/CA310) 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 $\theta\Phi=0$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta\Phi=90$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta\Phi=180$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta\Phi=270$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be $3.3 \pm 0.3\text{V}$ at 25°C . Optimum viewing angle direction is 6 'clock

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	85	89	-	Deg.	Note 1
		Θ_9		85	89	-	Deg.	
	Vertical	Θ_{12}		85	89	-	Deg.	
		Θ_6		85	89	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	700	1000	-		Note 2
Color Gamut	sRGB	CIE1931	$\Theta = 0^\circ$	95	99	-	%	Note 5
Reproduction of color	White	Wx	$\Theta = 0^\circ$	Typ -0.05	0.313	Typ +0.05		
		Wy			0.329			
Response Time		Tr+Td	Ta= 25° C $\Theta = 0^\circ$	-	14	25	ms	Note 6
Brightness		LW	760mA	1500	-	-	cd/m2	

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 FIGURE 1).

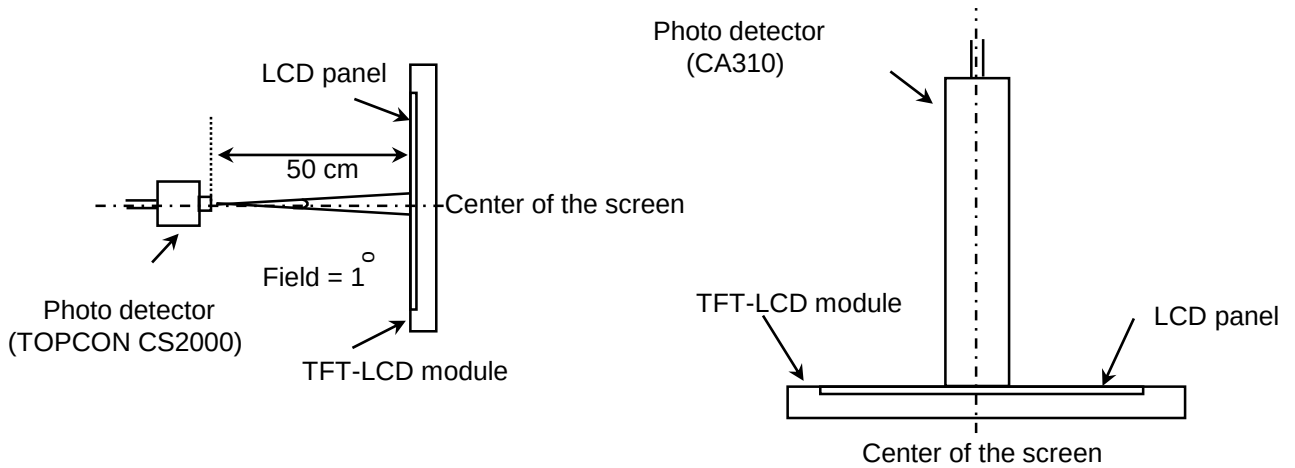
2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. The color chromaticity coordinates specified in Table 5. 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.
4. The electro-optical response time measurements shall be made as FIGURE 2 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 .

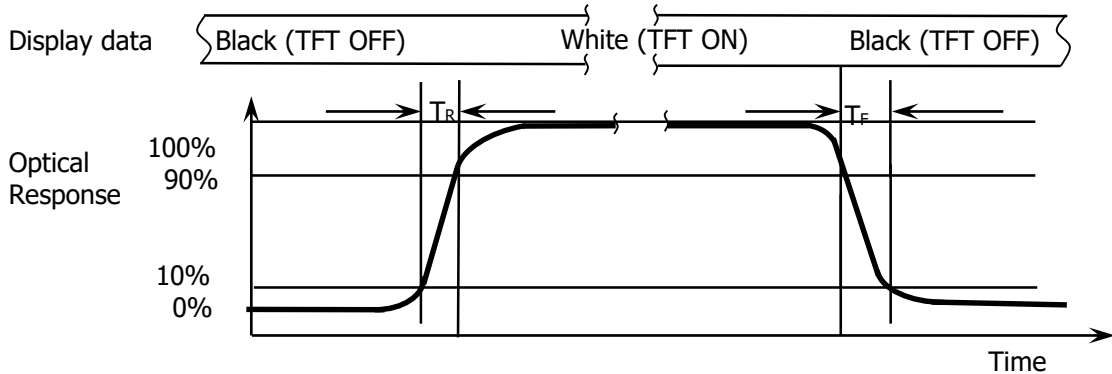
9.0.2 Optical measurements

Figure 1. Measurement Set Up



View angel range, uniformity, etc. measurement setup Flicker, measurement setup

Figure 2. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 3 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 .

10.0 Backlight

< Backlight Unit Electrical Specifications >

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Light Bar Input Voltage Per Input Pin	VPI N	48	50	54	V	Duty 100%
LED Light Bar Input Current Per Input Pin	IPIN		760	-	mA	Note1
LED Power Consumption	PBL	36.5	38	41	W	Note2
LED Life-Time	-	25,000	-		Hrs	Note 3

LED bar consists of 105 LED packages, 7 strings (parallel)*15packages(serial)

Note1: There are one light bar, and the specific current is input LED chip 100% duty current

Note2: $PBL = \text{Input pins} \times VPI \times IPIN$

Note3: The lifetime is determined as the time at which luminance of LED become 50% of the initial brightness operating at

$25 \pm 2^{\circ}\text{C}$

Technical drawing of a rectangular frame assembly, likely a display or panel. The drawing includes a top view and two side views. The top view shows a rectangular frame with a central opening. Dimensions are provided: 80.9 (width), 320.5 (height), 248 (inner width), and 544.8 (inner height). The side views show the profile of the frame, with dimensions 11.5 and 9.08. The drawing is divided into sections A, B, C, D, and E.

Rev	ECN NO.	DESCRIPTION	APPD	DATE
1	2	3	4	5

BP	TOOLS	NUMBER	BPTOOLSNUMBER	CUSTOMER
TTY238XHT-02	PART NAME	PART NAME	UNIT'S	MM
Rev: REV	ITEM	PART NUMBER	APPD	DATE
SHEET	TITLE	PART M & T	MAT'L	DRAWING

RM	材料	M	手工	材料	MC	CNC	材料	H	材料	GP	平面	材料	NF	CNC	材料	KV	材料	MM	材料	VE	材料	GS	材料	ES	材料	QC	材料
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

12.0 RELIABILITY TEST

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

<Table 9. Reliability test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 80°C, 240 hrs	
2	Low temperature storage test	Ta = -30 °C, 240 hrs	
3	High temperature operation test	Ta = 70°C, 240 hrs	
4	Low temperature operation test	Ta = -20 °C, 240 hrs	
5	High temperature & high humidity operation test	Ta = 50 °C, 80%RH, 240 hrs	
6	Thermal shock	Ta = -20 °C ↔ 70°C (0.5 hr), 100 cycle	Non-operation
7	Image Sticking	5*7chess, 点灯4h@127, aging 1min, L1@25°C	