



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, TD.

# TFT-LCD Module Specification

**Module NO.:** TST128JUW1-01

**Version:** V1.0

APPROVAL FOR SPECIFICATION

APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Organized by

### Record of Revisions

Rev.	Date	Sub-Model	Description of change
1.0	Jan., 21, 2019	A**	Preliminary Specification was first released (for Mock-up sample)

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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

Team Source Display model TST128JUW1-01 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 12.8" (16:9) inch diagonally measured active display area with 5760 x 1080 dot (1920 horizontal by 1080 vertical pixel) resolution.

### 1.2 Features

- 12.8 (16:9 diagonal) inch configuration
- 16.7M
- ROHS / Halogen Free Compliance

### 1.3 Applications

- Automobile

### 1.4 General information

Item	Specification	Unit	
Outline Dimension	294.4(H) x 175.0(V) x 6.5(Typ.)	mm	
Display area	283.392(H) x 159.408(V)	mm	
Number of Pixel	1920 RGB (H) x 1080(V)	pixels	
Pixel pitch	0.1476(H) x 0.1476 (V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display mode	Normally Black		
NTSC	75 (typ.)	%	
Surface treatment	Glare		
Weight	460 (Typ.)	g	
Back-light	Single LED (Side-Light type)		
Power Consumption	Logic System (White Pattern)	1.65 W (Max)	W
	B/L System	13.872 (Max.)	W

### 1.5 Mechanical Information

Item	Min.	Typ.	Max.	Unit	
Module Size	Horizontal (H)	293.9	294.4	294.9	mm
	Vertical (V)	174.5	175.0	175.5	mm
	Depth (D)	6.0	6.5	7.0	mm
Weight	—	460	—	g	

## 2.0 ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical Absolute Rating

#### 2.1.1 TFT LCD Module

Parameters	Symbol	Min.	Max.	Unit	Note
Power Logic	VCC	-0.3	4	V	

### 2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T <sub>opa</sub>	-30	85	°C	
Storage Temperature	T <sub>stg</sub>	-40	90	°C	

### 3.0 OPTICAL CHARACTERISTICS

#### 3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast		CR	$\Theta=0$ Normal viewing angle		1400	—		(1)(2)	
Response time	Rising	$T_R$		—	13	16	msec	(1)(3)	
	Falling	$T_F$		—	12	14			
White luminance (Center)		$Y_L$			530	700	—	cd/m <sup>2</sup>	(1)(4) ( $I_L=280mA$ )
Color chromaticity (CIE1931)	White	$W_x$				<b>TBD</b>			(1)(4)
		$W_y$				<b>TBD</b>			
	Red	$R_x$				<b>TBD</b>			
		$R_y$				<b>TBD</b>			
	Green	$G_x$				<b>TBD</b>			
		$G_y$				<b>TBD</b>			
	Blue	$B_x$			<b>TBD</b>				
		$B_y$			<b>TBD</b>				
Viewing angle	Hor.	$\Theta_L$	CR>10	80	85	—			
		$\Theta_R$		80	85	—			
	Ver.	$\Theta_U$		80	85	—			
		$\Theta_D$		80	85	—			
Brightness uniformity		$B_{UNI}$	$\Theta=0$	70	80	—	%	(5)	
Optima View Direction		Free						(6)	

#### 3.2 Measuring Condition

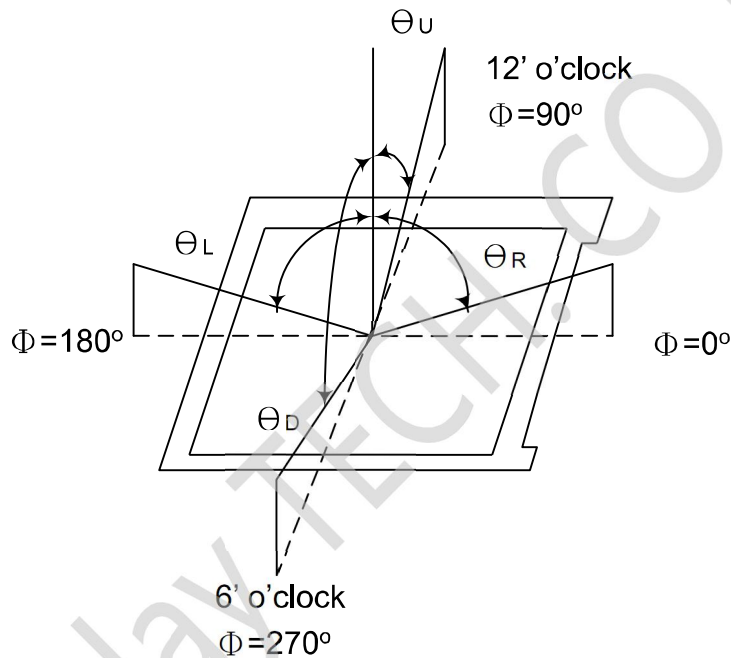
- Measuring surrounding : dark room
- LED current  $I_L$  : **280mA**
- Ambient temperature :  $25\pm 2^\circ C$
- 15min. warm-up time.

### 3.3 Measuring Equipment

■ FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

■ Measuring spot size : 20 ~ 21 mm

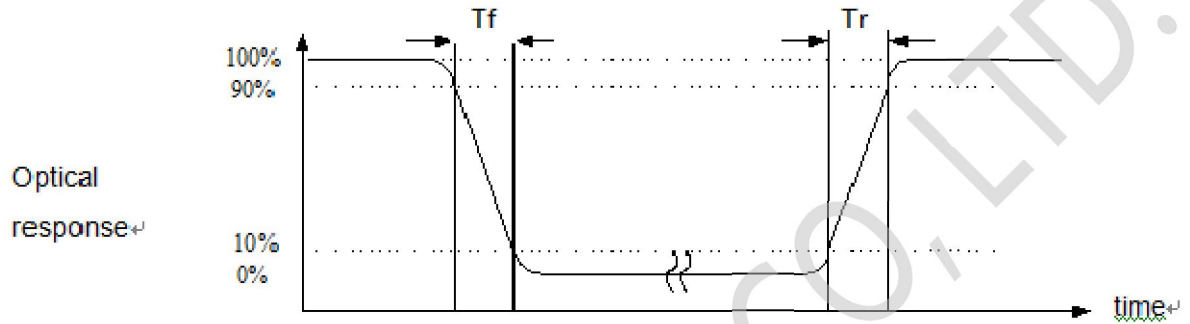
**Note (1)** Definition of Viewing Angle:



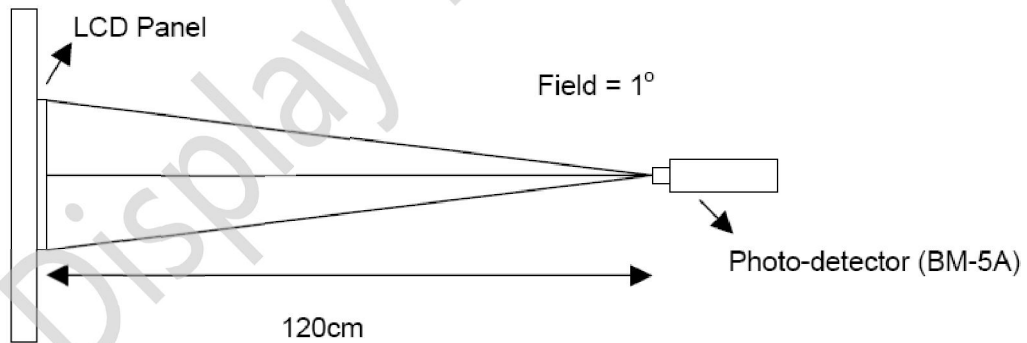
**Note (2)** Definition of Contrast Ratio (CR) :  
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

**Note (3)** Definition of Response Time : Sum of  $T_R$  and  $T_F$

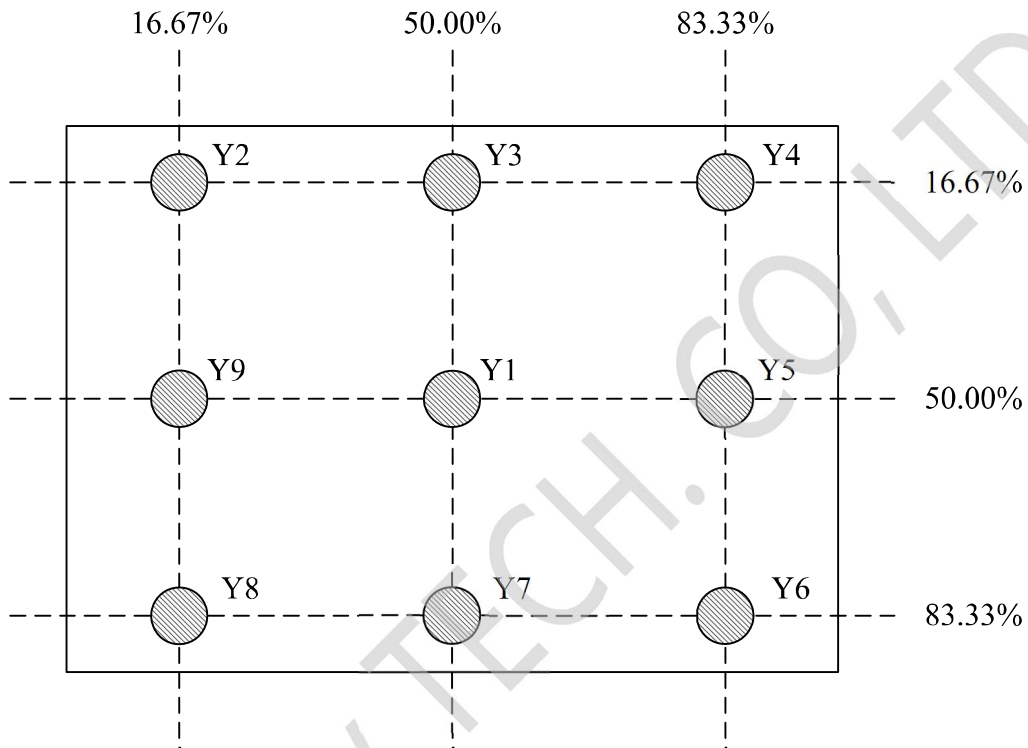


**Note (4)** Definition of optical measurement setup





**Note (5)** Definition of brightness uniformity

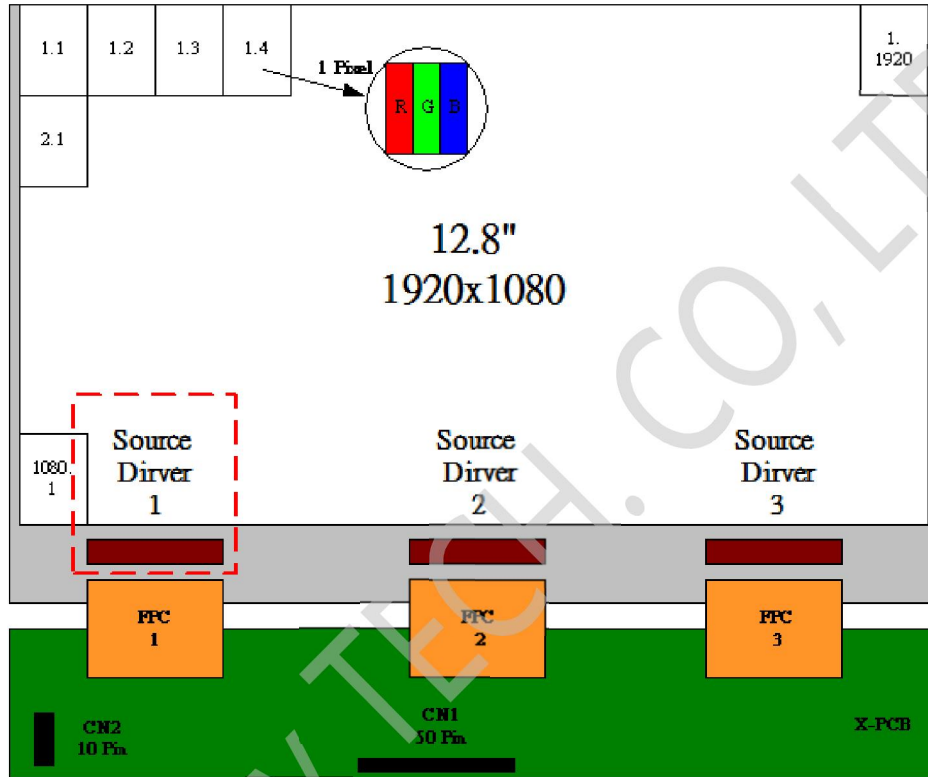


$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

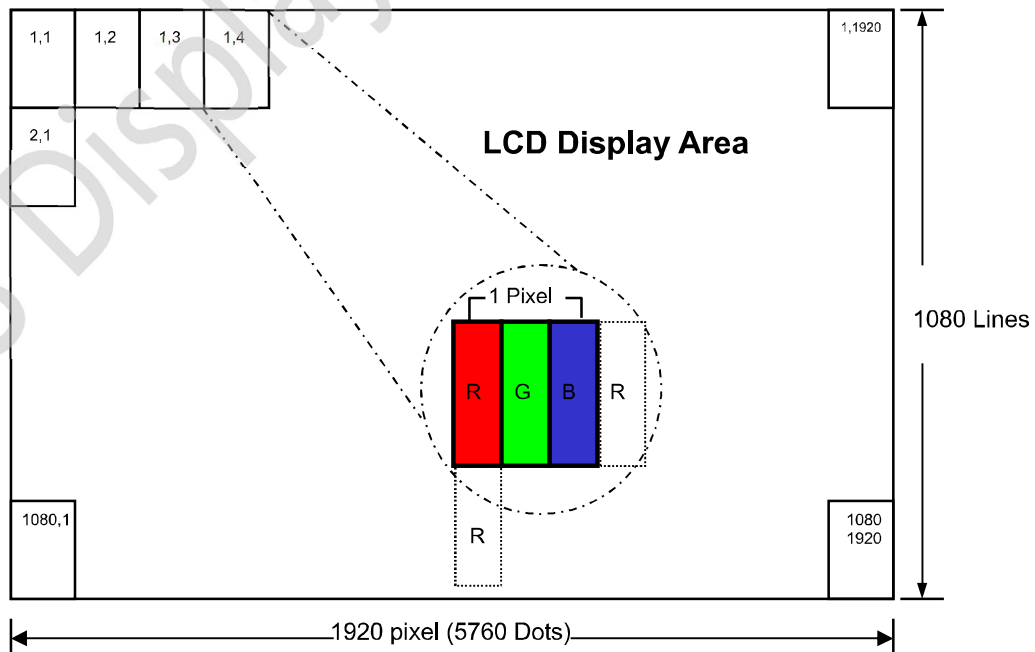
**Note (6)** : Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)

## 4.0 BLOCK DIAGRAM

### 4.1 TFT LCD Module:



### 4.2 Pixel Format



### 4.3 Relationship Between Displayed Color and Input

	Display	MSB				LSB				MSB				LSB				MSB				LSB				Gray scale Level
		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 color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	Light	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
Red	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255		
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	Light	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252	
		L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253	
		L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L254	
Green	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255			
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L254
Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255		
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L1		
		L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L2		
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	Light	H	H	H	H	H	L	L	H	H	H	H	H	L	L	H	H	H	H	H	L	L	L	L252		
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L	L	L	L253		
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L	L	L	L254		
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255			

## 5.0 INTERFACE PIN CONNECTION

CN1 FPC connector is used for electronics interface.

AORORA F31L-1A7H1-21050 or BJD 101049-205050 (50PIN)

Pin no.	Symbol	Function
1	GND	Power ground
2	NC/BIST	No connector(BIST Pin)
3	VCC	Digital Power/Vin = 3.3V
4	VCC	Digital Power/Vin = 3.3V
5	GND	Power ground
6	GND	Power ground
7	NC	No connector(Serial interface OTP Power)
8	NC	No connector
9	GND	Power ground
10	ORXIN0-	Negative LVDS differential data input (Odd data)
11	ORXIN0+	Positive LVDS differential data input (Odd data)
12	ORXIN1-	Negative LVDS differential data input (Odd data)
13	ORXIN1+	Positive LVDS differential data input (Odd data)
14	ORXIN2-	Negative LVDS differential data input (Odd data)
15	ORXIN2+	Positive LVDS differential data input (Odd data)
16	ORXCLKIN-	Negative LVDS differential clock input (Odd clock)
17	ORXCLKIN+	Positive LVDS differential clock input (Odd clock)
18	ORXIN3-	Negative LVDS differential data input (Odd data)
19	ORXIN3+	Positive LVDS differential data input (Odd data)
20	ERXIN0-	Negative LVDS differential data input (Even data)
21	ERXIN0+	Positive LVDS differential data input (Even data)
22	ERXIN1-	Negative LVDS differential data input (Even data)
23	ERXIN1+	Positive LVDS differential data input (Even data)
24	ERXIN2-	Negative LVDS differential data input (Even data)
25	ERXIN2+	Positive LVDS differential data input (Even data)
26	ERXCLKIN-	Negative LVDS differential clock input (Even clock)
27	ERXCLKIN+	Positive LVDS differential clock input (Even clock)
28	ERXIN3-	Negative LVDS differential data input (Even data)
29	ERXIN3+	Positive LVDS differential data input (Even data)

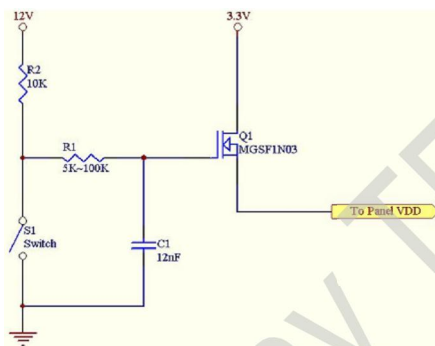
30	GND	Power ground
31	FAULT	FAULT signal output(normal=L,abnormal=H)
32	RESET	Global reset pin,active low.
33	STBYB	Standby mode,active low.
34	NC	No connector(Serial interface chip enable.CSB)
35	NC	No connector(Serial interface clock input.SCL)
36	NC	No connector(Serial interface data input/output.CDA)
37	NC	No connector(Serial interface data input/output.CDA)
38	GND	Power ground
39	GND	Power ground
40	NC	No connector
41	LEDA	LED power (Anode)
42	LEDA	LED power (Anode)
43	LEDA	LED power (Anode)
44	NC	No connector
45	LEDK	Cathode 1
46	LEDK	Cathode 2
47	LEDK	Cathode 3
48	LEDK	Cathode 4
49	NTC_A	NTC_Anode
50	NTC_K	NTC_Cathode
Note: NTC :Murata NCU15XH103F6SRC		

## 6.0 ELECTRICAL CHARACTERISTICS

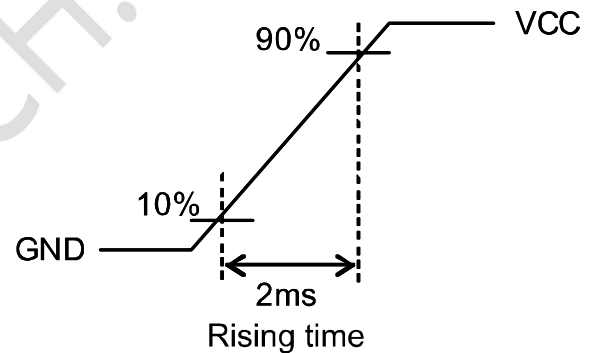
### 6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VCC	3	3.3	3.6	V	
Input signal voltage	V <sub>IH</sub>	VCC*0.7	-	VCC	V	
	V <sub>IL</sub>	0	-	VCC*0.3	V	
Current of power supply	I <sub>DD</sub>	--	-	500	mA	VCC =3.3V White pattern
Inrush current	I <sub>RUSH</sub>	-	-	2.0	A	Note*

Note\* : Inrush current test circuit and rising time setting (power on)



Test circuit

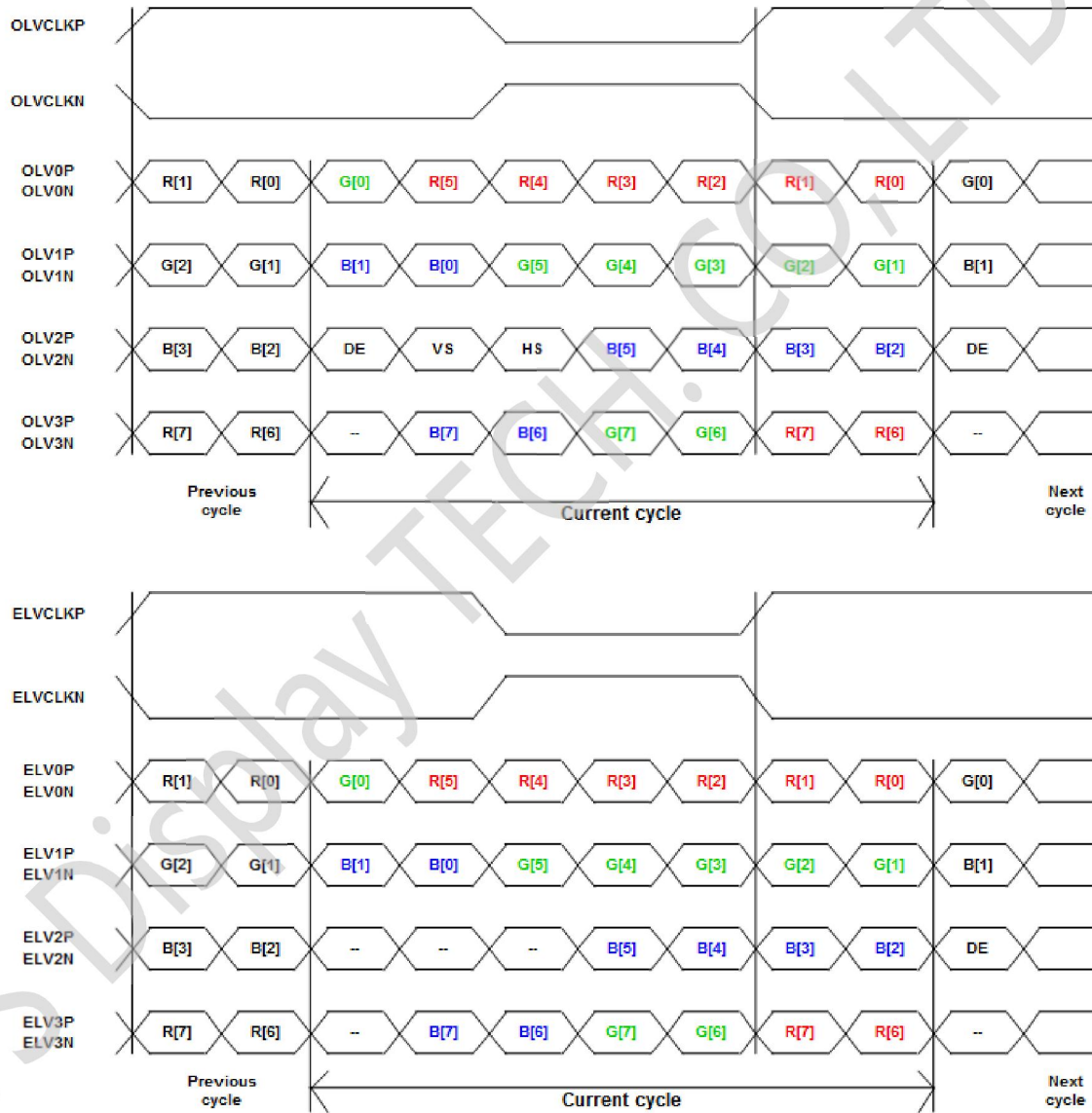


### 6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V <sub>th</sub>	-	-	100	mV	V <sub>CM</sub> =1.2V
Differential Input Low Threshold	V <sub>tl</sub>	-100	-	-	mV	
Input Current	I <sub>IN</sub>	-10	-	+10	uA	
Differential input Voltage	V <sub>ID</sub>	0.1	-	0.6	V	
Common Mode Voltage Offset	V <sub>CM</sub>	1	1.2	1.7-( V <sub>ID</sub>  /2)	V	

### 6.3 Bit LVDS input

#### 6.3.1 8Bit LVDS input



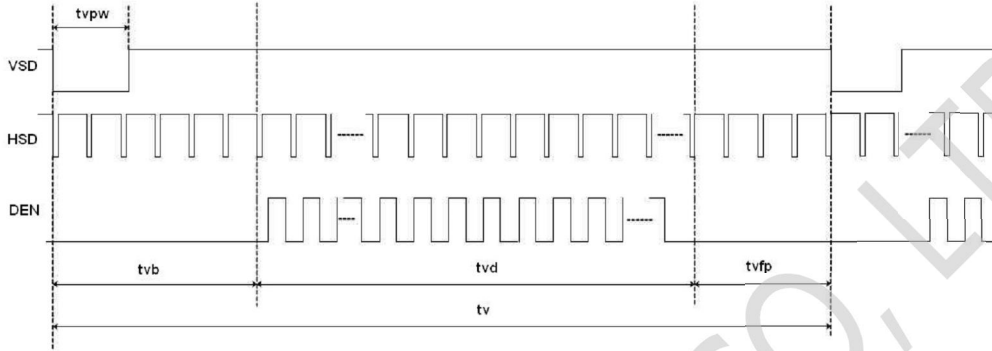
#### 6.4 Interface Timing (DE mode)

Interface Timing (DE mode) Two Port LVDS Timing.(1920xRGBx1080)					
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	FR	<b>55</b>	<b>60</b>	<b>65</b>	Hz
Vertical Display Time	T <sub>vd</sub>	<b>1080</b>			H
Vertical pulse width	T <sub>vpw</sub>	<b>1</b>	<b>3</b>	<b>20</b>	H
Vertical back porch	T <sub>vbp</sub>	<b>2</b>	<b>24</b>	<b>200</b>	H
Vertical front porch	T <sub>vfp</sub>	<b>5</b>	<b>8</b>	<b>200</b>	H
Frame Period	T <sub>v</sub>	<b>1087</b>	<b>1112</b>	<b>1404</b>	H
Horizontal Display Time	T <sub>hd</sub>	<b>960</b>			DCLK
Horizontal pulse width	T <sub>hpw</sub>	<b>10</b>	<b>12</b>	<b>200</b>	DCLK
Horizontal back porch	T <sub>hbp</sub>	<b>5</b>	<b>16</b>	<b>200</b>	DCLK
Horizontal front porch	T <sub>hfp</sub>	<b>24</b>	<b>26</b>	<b>200</b>	DCLK
1 Horizontal line	T <sub>v</sub>	<b>989</b>	<b>1012</b>	<b>1248</b>	DCLK
Clock Rate	F <sub>DCLK</sub>	<b>64.5</b>	<b>66.9</b>	<b>80</b>	MHz

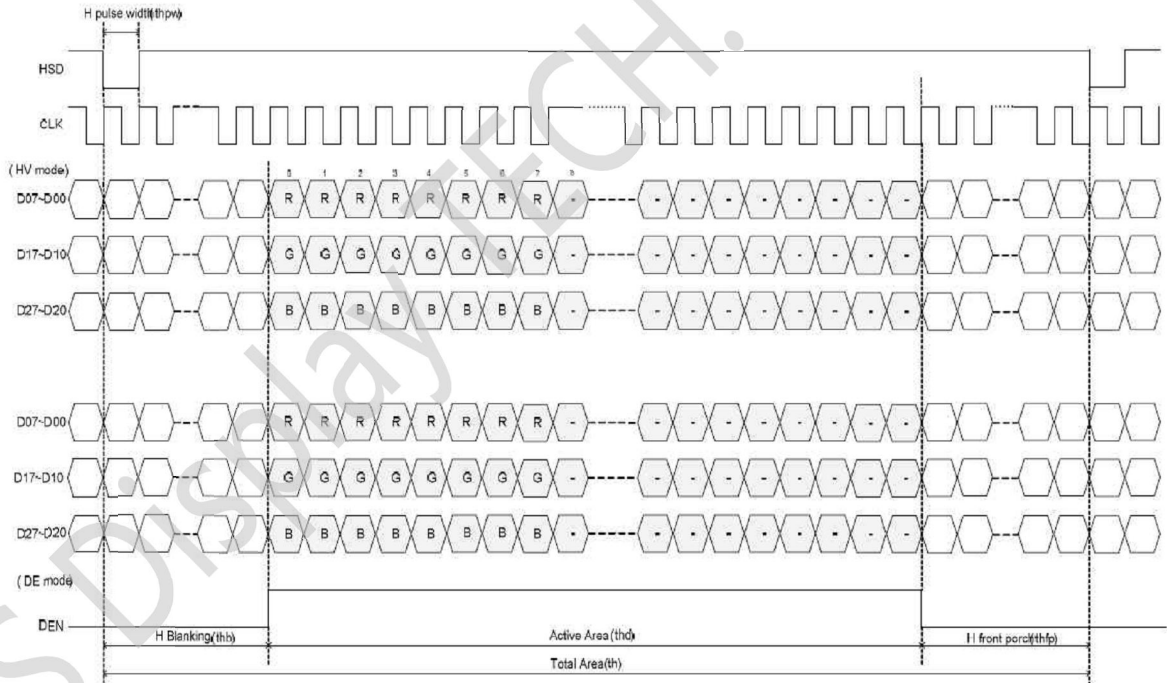


**Timing Diagram of Interface Signal (DE mode)**

**(1) Vertical input timing**

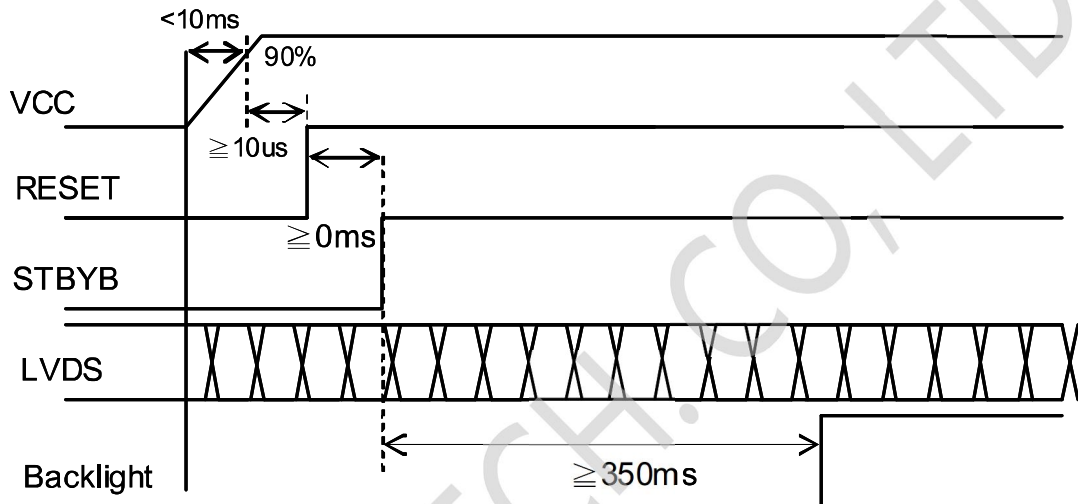


**(2) Horizontal Vertical input timing**

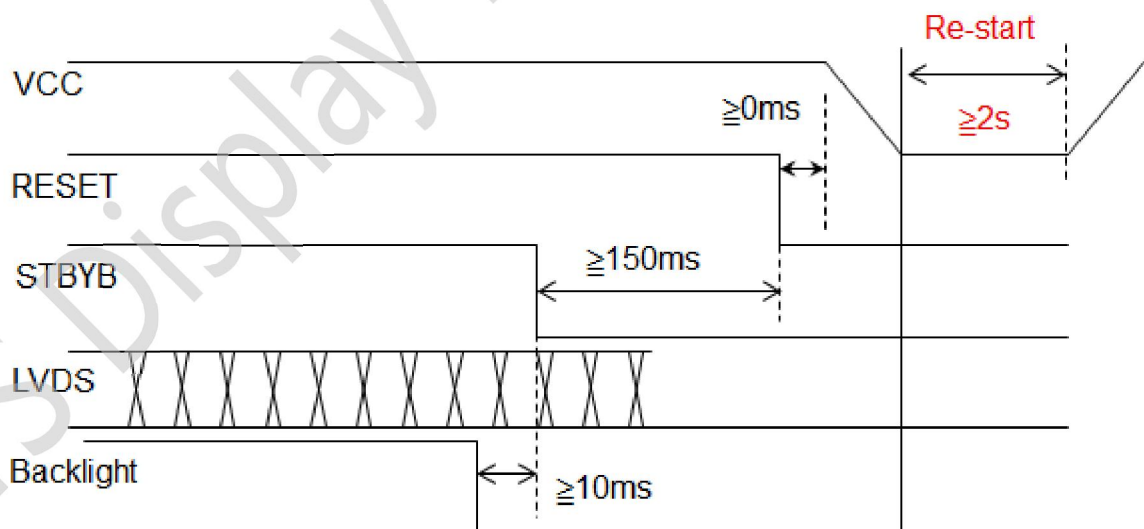


### 6.5 Power On / Off Sequence

#### Power ON



#### Power OFF



### 6.6 Backlight Unit

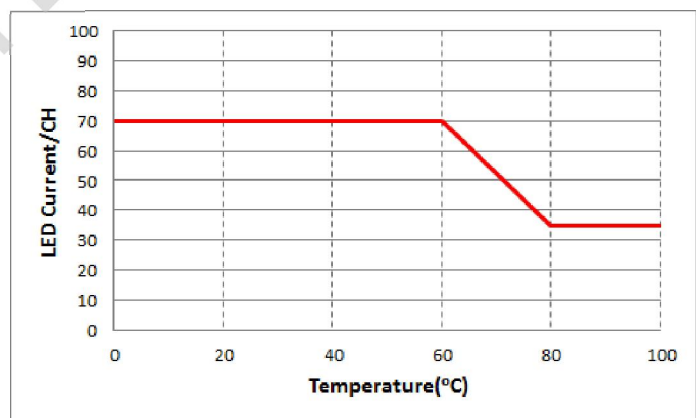
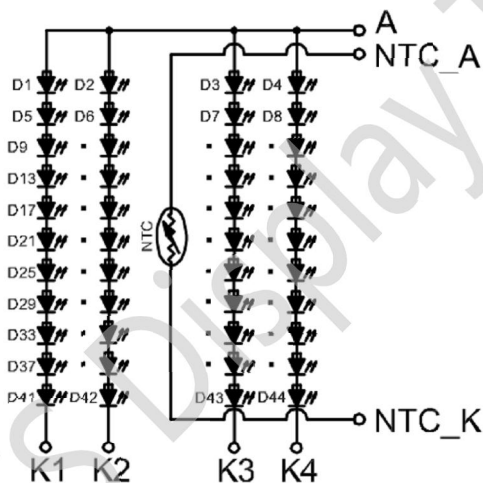
Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	$I_F$	--	340	—	mA	$T_a=25^{\circ}\text{C}$
LED Voltage	$V_F$	—	38.4	40.8	Volt	$T_a=25^{\circ}\text{C}$
LED Life-Time	N/A	30,000	—	—	Hour	$T_a=25^{\circ}\text{C}$ $I_F=70\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition:  $T_a=25\pm 3^{\circ}\text{C}$ , typical  $I_L$  value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at  $T_a=25^{\circ}\text{C}$  and  $I_L=340\text{mA}$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 300 mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit 12S4P =48pcs LED

Note (4) LED temperature current curve, The temperature at 60 degrees before the output 70mA / CH, 60 degrees to 80 degrees when the linear drop to 35mA.



## 7.0 RELIABILITY TEST ITEMS

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+90°C, 500hrs	1, 2, 3
2	Low Temperature Storage	Ta=-40°C, 500hrs	1, 2, 3
3	High Temperature Operation	Ta=+85°C, 500hrs	1, 2, 3
4	Low Temperature Operation	Ta=-30°C, 500hrs	1, 2, 3
5	High Temperature and High Humidity (operation)	Ta=+65°C, 90%RH, 240hrs	1, 2, 3
6	Thermal Cycling Test (non operation)	-30°C(30min)→+85°C(30min),100 cycles	1, 2, 3
7	Electrostatic Discharge	Contact = ± 8 kV, class B;(R=330Ω,C=150pF) Air = ± 15 kV, class B;(R=330Ω,C=150pF) 1 time for each point.	
8	Vibration	1.Random: 1.04G, 10~500Hz, XYZ, 30min/each direction 2.Sine: Freq. 1.5G, 8~33.3Hz, Stoke: 1.3mmhz Sweep: 2.9G, 333.3~400 X/Z: 2hrs, Y:4hrs	
9	Shock	Half-Sine, 100G, 6ms, ±XYZ, 1time	
10	Vibration (with carton)	Random: 0.015G <sup>2</sup> /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ 各方向 2hrs	
11	Drop (with carton)	Drop height condition, basis on the product weight and Follw QB100-0027 1 corner, 3 edges, 6 surfaces	

Note1: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

Note2: The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample shall be free from defects:

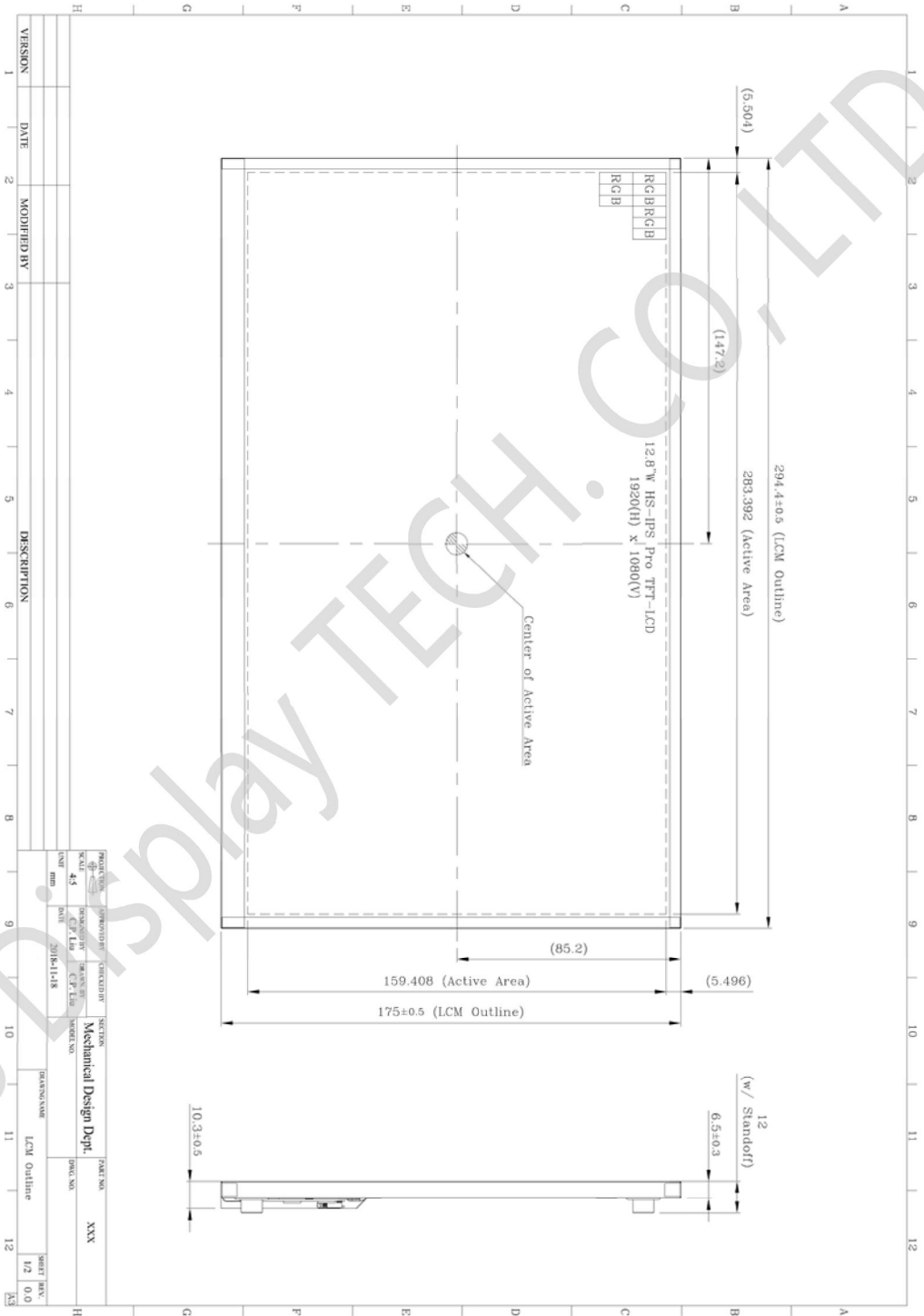
(Air bubble in the LCD、Seal leak、Non-display、Missing segments、Glass crack).

Note3: The test condition definition panel's surface temperature.

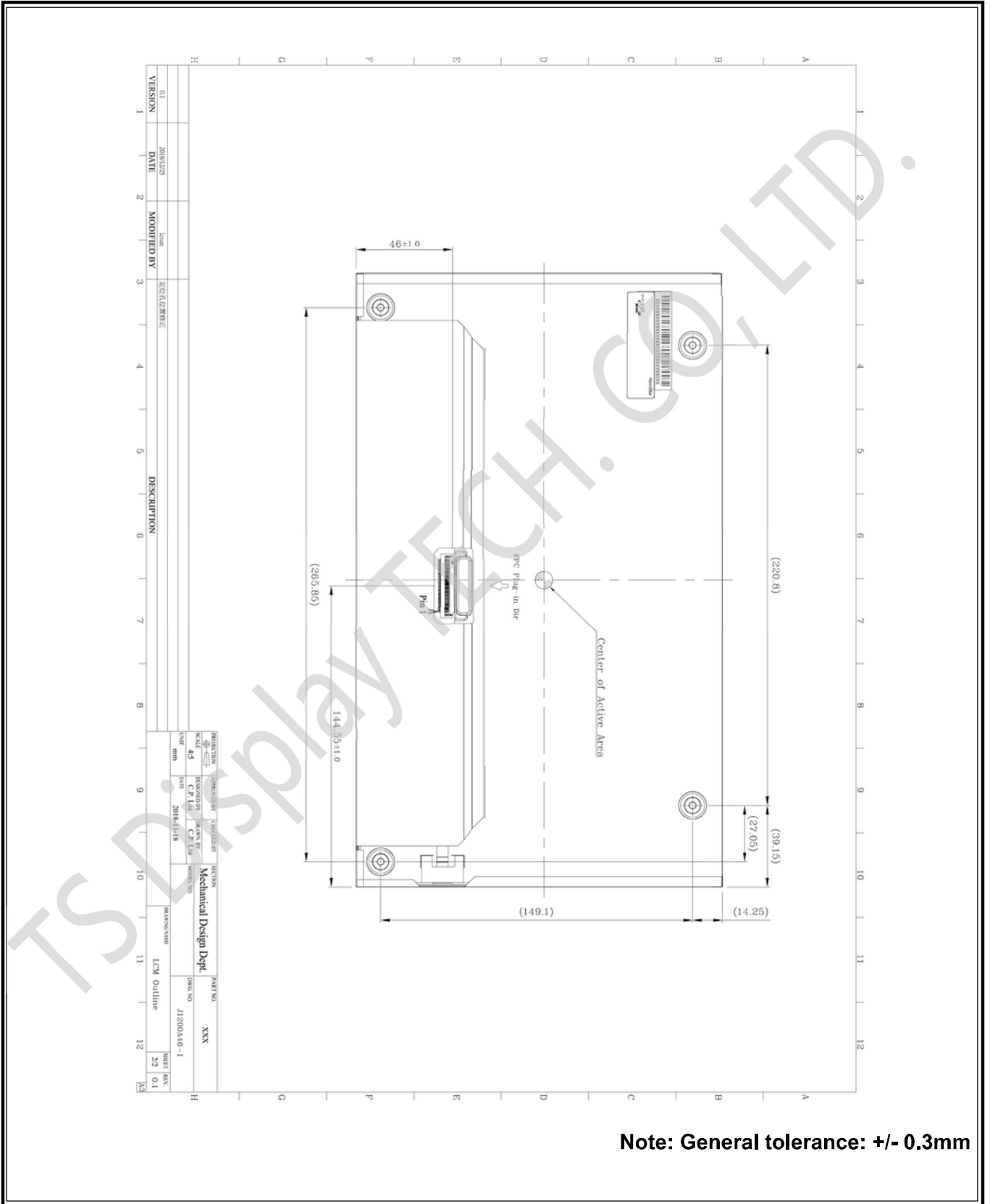
Note4: Each test item applies for a test sample only once, the test sample cannot be used again in any other test item.

### 8.0 OUTLINE DIMENSION

Unit : mm



Note: General tolerance: +/- 0.3mm



**Note: General tolerance: +/- 0.3mm**

## 9.0 PACKAGE SPECIFICATION

### 9.1 Packing form

Item	Q'ty	Material	Size
①	2	EPE Board (T/B)	480 x 360 x 20mm
②	2	EPE Board (L/R)	325 x 235 x 20mm
③	2	EPE Board (F/RE)	480 x 235 x 20mm
④	1	Corrugated Paperboard (AB Flute)	500 x 380 x 312mm
⑤	11	PET Tray	440 x 320 x 24.1mm

(1) Package quantity in one carton: 20 pieces.

### 9.2 Packing assembly drawings

