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To :

Date :

TFT LCD

ET088BA01-GL

ACCEPTED BY :

C10

APPROVED BY	CHECKED BY	PREPARED BY



REVISION STATUS

[illegible]

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1.OVERVIEW

ET088BA01-GL is 8.8" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) Module composed of LCD Panel, driver ICs, control circuit and LED backlight. By applying 1280×480 resolution images are displayed on the 8.8" diagonal screen, Display 16.7M color by R.G.B signal input.

General specifications are summarized in the following table :

ITEM	SPECIFICATION			
Panel Size	8.8" inch			
Display Area (mm)	209.28 (H) x 78.48 (V)			
Number of Pixels	1280(H) x480(V)			
Pixel Pitch (mm)	0.1635 (H) x 0.1635 (V)			
Color Pixel Arrangement	RGB Vertical stripe			
Display Mode	Normally Black			
Number of Colors	16.7M(8bits)			
Brightness(cd/m ²)	1000nits(typ)			
Response Time (ms)	25ms(typ)			
Color Gamut	70%(min)			
Viewing Direction	Free			
Contrast ratio	1300:1			
Interface connection	LVDS interface			
Module Size(mm)		Min.	Typ.	Max
	Horizontal (H)	228.6	228.9	229.2
	Vertical (V)	96.3	96.6	96.9
	Depth (D)	5.4	5.7	6.0
Module Weight (g)	TBD			
Backlight Unit	LED			
Surface Treatment	HC 3H			



2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remark
Power Supply input Voltage	VDD	3.0	3.6	V	
Operating Ambient Temperature	T _{OP}	-30	+85	°C	
Operating Ambient Humidity	H _{OP}	60	90	% (RH)	At 60°C
Storage Temperature	T _{STG}	-30	+85	°C	
Storage Humidity	H _{STG}	60	90	% (RH)	At 60°C

【Note:】

- *1) If the product were used out of the operation and storage, it will have quality issue.
- *2) Ifp Conditions: Pulse Width ≤ 10msec, Duty ≤ 1/10
- *3) Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward

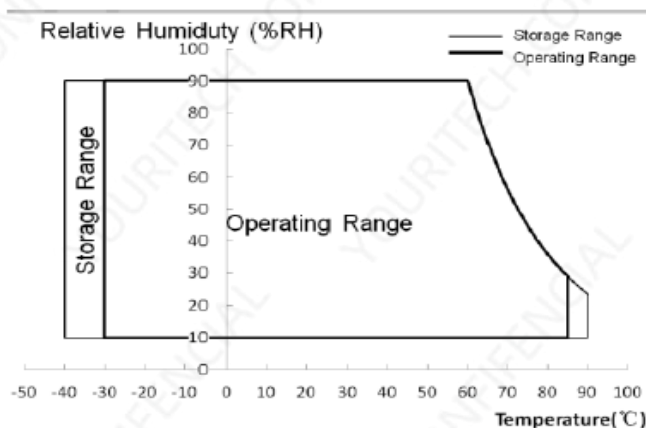


Figure 2. Operating and storage environment

- *4) If users use the product out off the environmental operation range (temperature and humidity), it will have visual quality concens.



3. ELECTRICAL CHARACTERISTICS

3.1 Typical Operation Conditions

Item	Symbol	Min.	TYP.	Max.	Unit	Remark
Digital Power Supply Voltage For LCD	DVDD	3.0	3.3	3.6	V	Note2
Power Supply Current	IDD	-	-	232	mA	Note1
Power Consumption	mosaic	-	-	TBD	W	Note1
Inrush Current	linrush	-	-	1	A	

Note :

1: VGH should be set to satisfy charging ratio of TFT pixel.

2 : VCOM should be adjusted to make the flicker level be minimum and optimize display quality.

3: Frame rate=60HZ

3.3 Backlight

Item	Symbol	CONDITION	Min.	TYP.	Max.	Unit	Remark
LED current	IL	Ta=25°C Each serial=90mA	-	300	-	mA	
LED voltage	VL	Ta=25°C Each serial=90mA	-	21	-	V	
Power consumption	WL	Ta=25°C Each serial=90mA	-	6.3	-	W	
LED Lifetime	-	Ta=25°C Each serial=90mA	30000	-	-	Hr	



4. INTERFACE CONNECTION 4.1 CN1 (Input Signal)

Pin No.	SYMBOL	FUNCTION	Note
1	GND	Ground	
2	NC	No connection	
3	VCC	Power Supply 3.3V	
4	GND	Ground	
5	NC	No connection	
6	VCC	Power Supply 3.3V	
7	GND	Ground	
8	FAIL_DET	Fail detection	
9	NC	No connection	
10	NC	No connection	
11	NC	No connection	
12	NC	No connection	
13	NC	No connection	
14	NC	No connection	
15	GND	Ground	
16	VCC	Power Supply 3.3V	
17	GND	Ground	
18	ERXIN3+	LVDS Receiver Signal(+)	
19	ERXIN3-	LVDS Receiver Signal(-)	
20	GND	Ground	
21	ERXCLKIN+	LVDS Receiver Signal(+)	
22	ERXCLKIN-	LVDS Receiver Signal(-)	
23	GND	Ground	
24	ERXIN2+	LVDS Receiver Signal(+)	
25	ERXIN2-	LVDS Receiver Signal(-)	
26	GND	Ground	
27	ERXIN1+	LVDS Receiver Signal(+)	
28	ERXIN1-	LVDS Receiver Signal(-)	
29	GND	Ground	
30	ERXIN0+	LVDS Receiver Signal(+)	
31	ERXIN0-	LVDS Receiver Signal(-)	
32	GND	Ground	
33	GND	Ground	
34	RESET	RESET Signal	
35	STBYB	STBYB Signal	
36	RL	Horizontal shift direction (source output) selection	
37	VCC	Power Supply 3.3V	
38	TB	Vertical shift direction(Gate output) selection	



39	GND	Ground	
40	NTC1	Thermistor	
41	NC	No connection	
42	NTC2	Thermistor	
43	GND	Ground	
44	VCC	Power Supply 3.3V	
45	GND	Ground	
46	LEDK1	LED Cathode	
47	LEDK2	LED Cathode	
48	LEDK3	LED Cathode	
49	LEDK4	LED Cathode	
50	NC	No connection	
51	LEDA	LED Anode	
52	LEDA	LED Anode	
53	GND	Ground	
54	VCC	Power Supply 3.3V	
55	SELB	8/6 bit mode selection (H=8bit, L=6bit)	
56	NC	No connection	
57	VCC	Power Supply 3.3V	
58	NC	No connection	
59	GND	Ground	
60	NC	No connection	



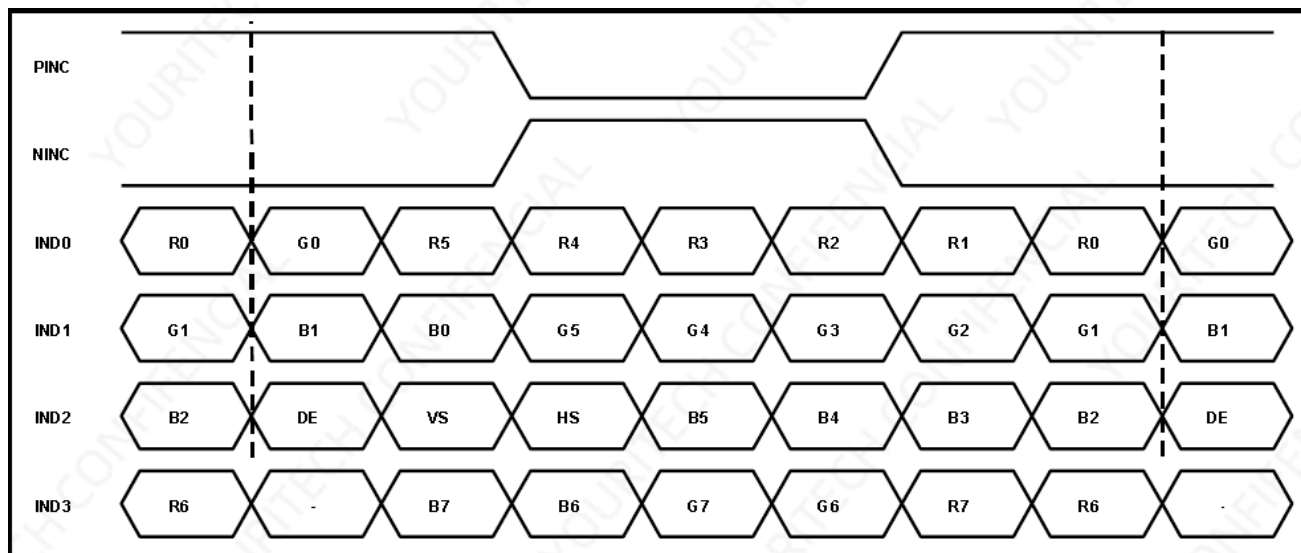
5. SIGNAL TIMING SPECIFICATION

5.1 Signal Timing Specification

LVDS Signal Timing

Parameter	Symbol	Panel Resolution			
		1280*480			
		Min.	Typ.	Max.	Unit
DCLK frequency	RxFCLK		40.5		MHz
Horizontal Display Area	Thd	1280			DCLK
1 horizontal line	Th	1342	1346	1398	DCLK
Vertical Display Area	tvd	480			DCLK
1 vertical line	tv	498	502	504	
Frame rate			60		HZ

5.2 Data Input Format



5.3 LVDS DC electrical characteristics

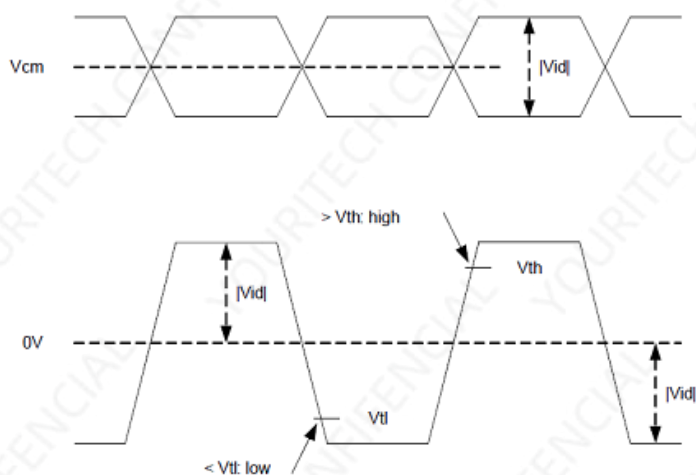
LVDS DC Characteristics

(VCC1=VCC1P=VCC2=VCCIF=3.0V to 3.6V, VSS1=VSS2=VSSA=0V, T_A=-40~105°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Differential input high Threshold voltage	V _{TH}	V _{CM} =1.2V	+0.1	-	-	V
Differential input low threshold voltage	V _{TL}	V _{CM} =1.2V	-	-	-0.1	V
Differential input common Mode voltage	V _{CM}	-	1	1.2	1.7- V _{id} /2	V
LVDS input voltage	V _{INLV}	-	0.7	-	1.7	V
Differential input voltage	V _{ID}	-	0.1	-	0.6	V
Differential input leakage Current	I _{LVLEAK}	-	-10	-	+10	μA

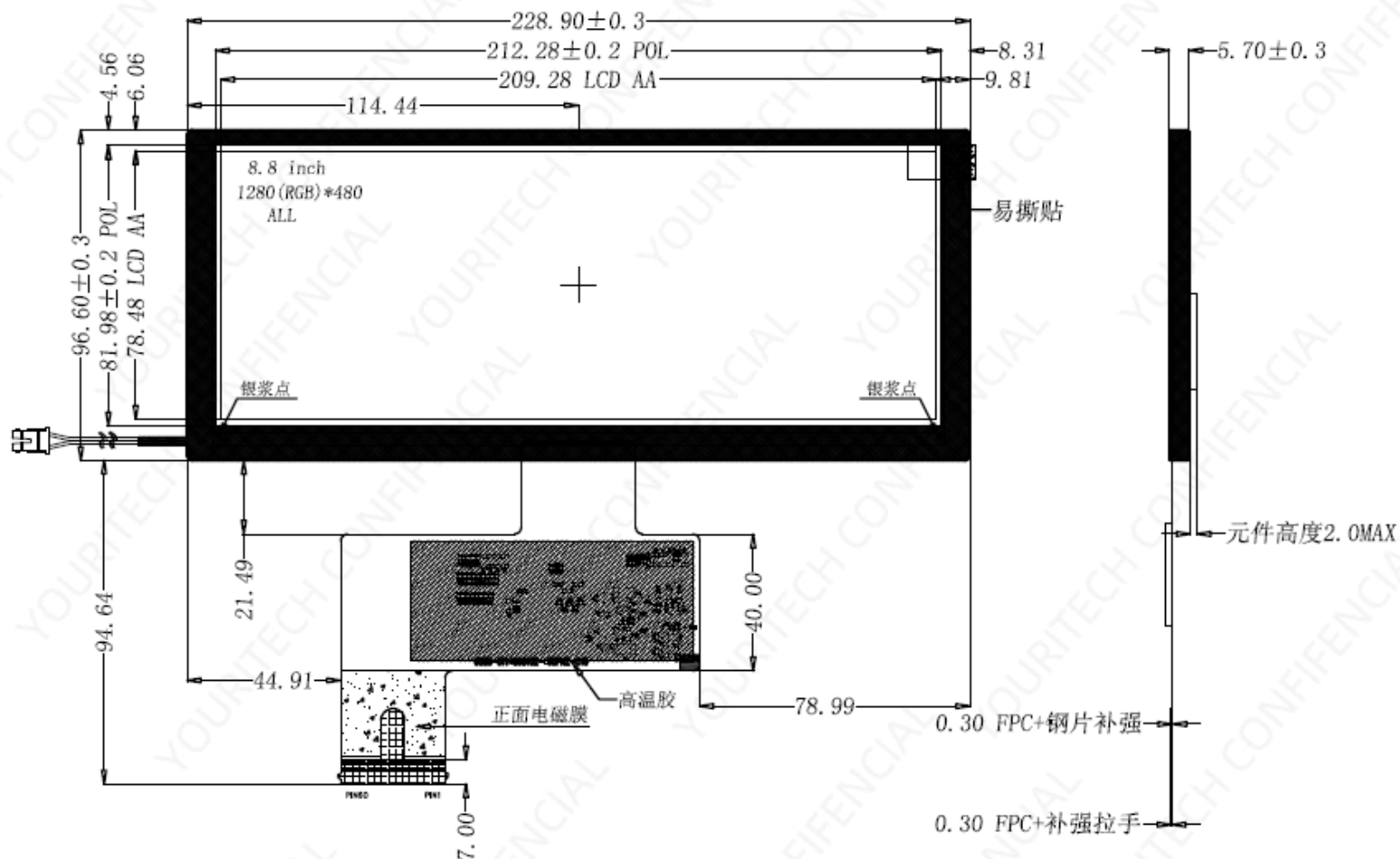
Single-ended:
LVCLKP,
LVCLKN,
LVD[3:0]P,
LVD[3:0]N

Differential:
LVCLKP-LVCLKN,
LVD[3:0]P-LVD[3:0]N

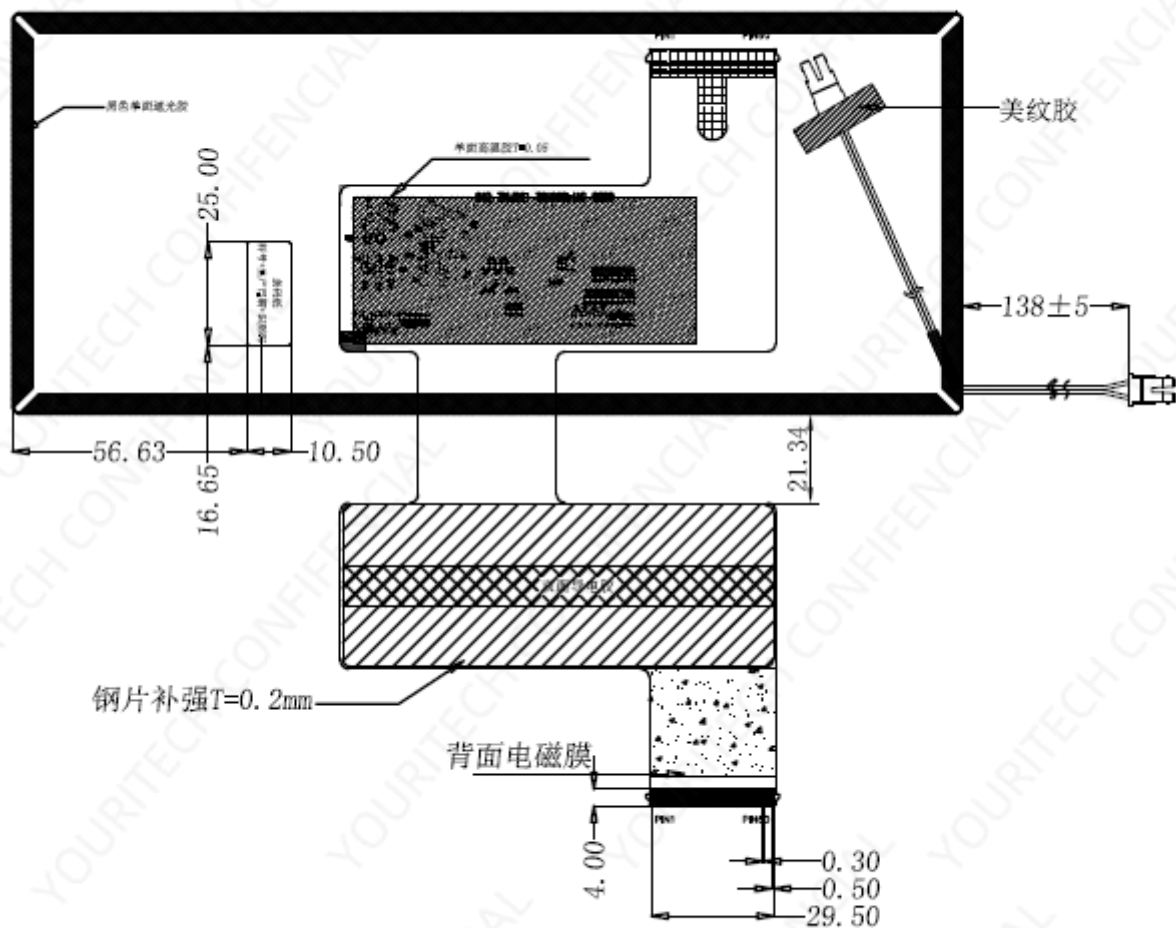


6. MECHANICAL DIMENSIONC

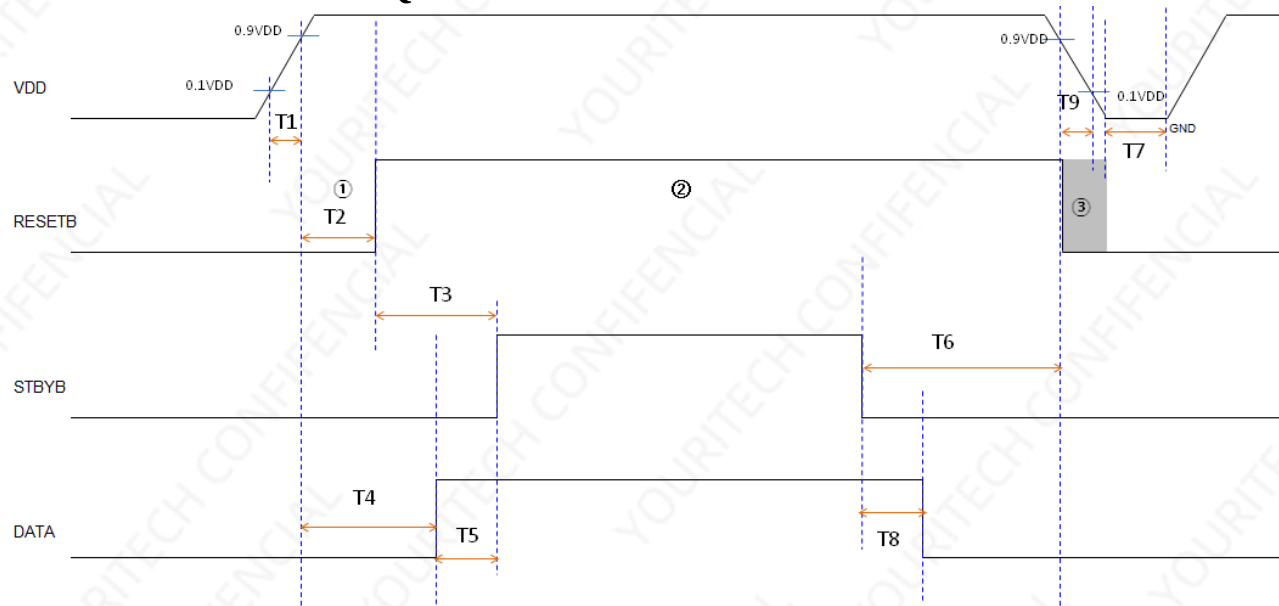
6.1 Front Side



6.2 Rear Side



7. POWER ON/OFF SEQUENCE



Parameter	Symbol	Unit	Min.	Typ.	Max.
VDD Rise Time	T1	ms	(0.5)	-	(20)
VDD to Reset	T2	us	(100)	-	-
Reset Good to STBYB	T3	ms	(14)	-	-
VDD -DATA	T4	ms	(0)	-	(50)
DATA to STBYB	T5	ms	(1)	(10)	-
STBYB to VDD	T6	ms	-	(33)	(83)
VDD power off	T7	ms	(500)	-	-
STBYB to L-DATA	T8	ms	(33)	-	(50)
VDD fall time	T9	ms	(0.5)	-	(30)



8. OPTICAL SPECIFICATION

8.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance 1 lux and temperature = 25 ±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) 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°. The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

8.2 Optical Specifications

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Contrast Ratio		CR	Point-5	1000:1	1300:1			1.2,3
Luminance(CEN)		Lw	Point-5	800	1000		cd/m ²	1.3
Luminance Uniformity		L		70	80		%	1.3
Response Time (White - Black)		Tr +Tf	Point-5	-	-	35	ms	1.3,5
NTSC		-	Point-5	-	70	-	%	1.4
Viewing Angle	Vertical	Upper(θ)	CR ≥ 10 Point-5	-	85	-	Deg	1.4
		Down(θ)		-	85	-	Deg	1.4
	Horizontal	Left(θ)		-	85	-	Deg	1.4
		Right (θ)		-	85	-	Deg	1.4
Color Coordinate	White	Wx	Point-5	0.264	0.304	0.344	-	1.3
		Wy		0.295	0.335	0.375		
	Red	Rx		0.549	0.589	0.629		
		Ry		0.301	0.341	0.381		
	Green	Gx		0.294	0.334	0.374		
		Gy		0.571	0.611	0.651		
	Blue	Bx		0.115	0.155	0.195		
		By		0.066	0.106	0.146		

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing 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.

2. Contrast measurements shall be made at viewing angle of $\theta = 0^\circ$ 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 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. Center trans of white is defined as 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 4 for a total of the measurements per display.

4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = (\text{Minimum Luminance of 9points} / \text{Maximum Luminance of 9points}) * 100$

5. 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. Measurement condition is C- light source.

6. The electro-optical response time measurements shall be made as FIGURE 5 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the transmittance to change from 10% to 90% is Tr, and 90% to 10% is Tf.



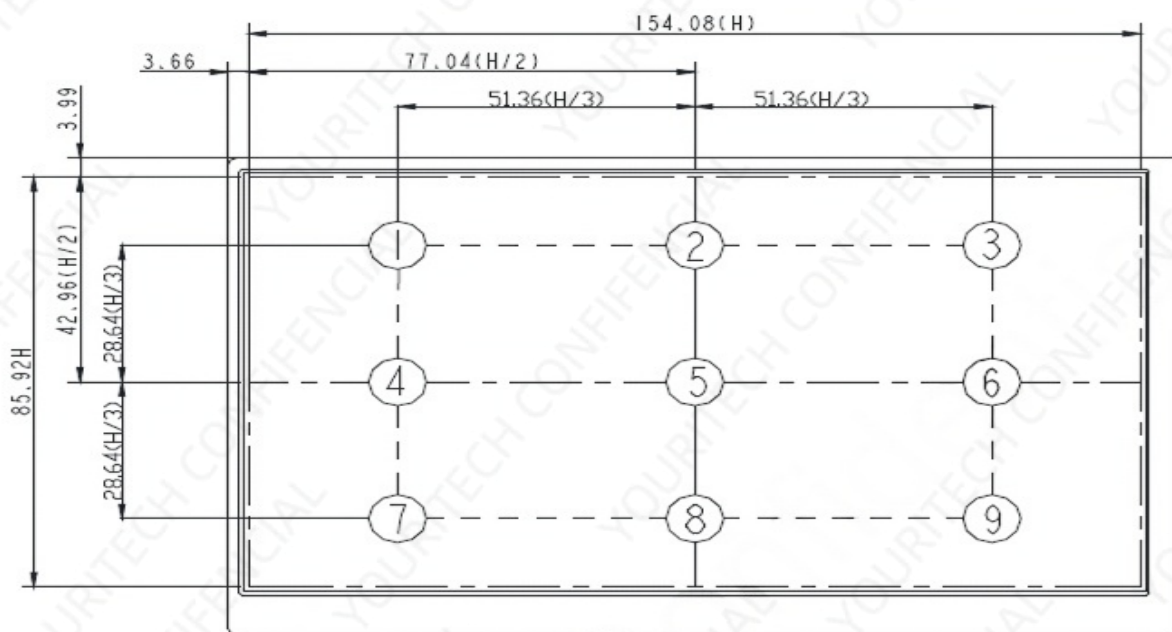


Fig.7-1 Measuring point

Note 4: Definition of Viewing Angle(θ) ,refer to Fig.7-2 as below:

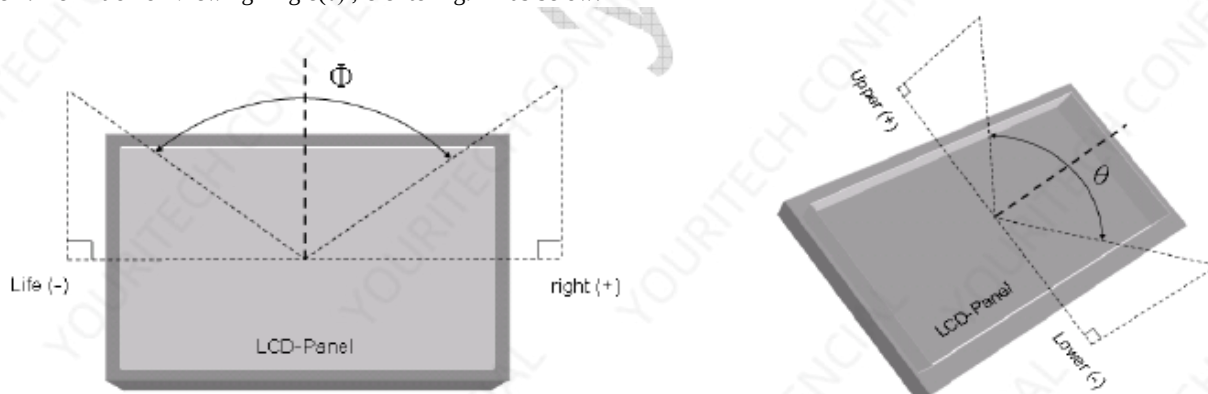


Fig.7-2 Definition of Viewing Angle

Note5: Definition of Response Time.(White-Black)

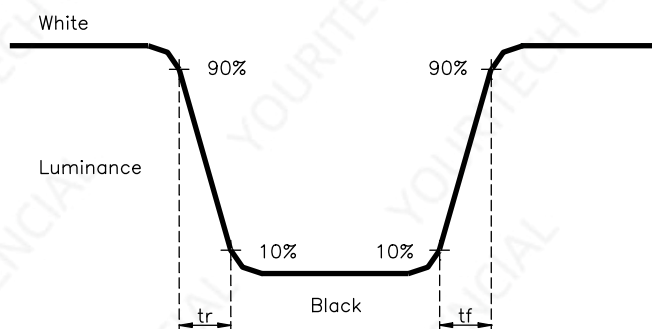


Fig.7-3 Definition of Response Time(White-Black)



9. RELIABILITY TEST ITEM

9.1 TEMPERATURE AND HUMIDITY

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	85℃ ; 500hrs	
High Temperature Storage	85℃ ; 50hrs	
High Temperature High Humidity Operation	60℃ ; 90%RH ; 480hrs (No condensation)	
Low Temperature Operation	-30℃ ;500hrs	
Low Temperature Storage	-30℃ ; 500hrs	
Thermal Shock	-30℃(0.5hr)~80℃(0.5hr); 32Cycles	Non- Operating
Image Sticking	70℃; 48hrs	Note 2
MTBF	30000 Hrs	

NOTE1:

All judgement of display are performed after temperature of panel return to room temperature.
Display function should be no change under normal operating condition.
Under no condensation of dew.
GTECH only guarantee the above 5 test items, and without guarantee the others.

NOTE2:

Condition of Image Sticking test: 25℃±2 °C
Operation with test pattern sustained for 4 hrs, then change to mid-gray pattern immediately.
After 5 mins, the mura must be disappeared completely .

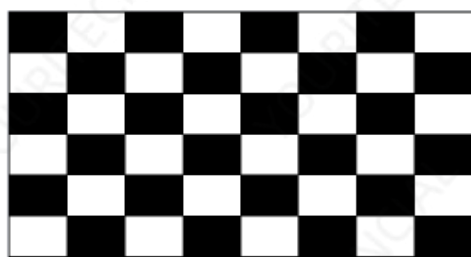
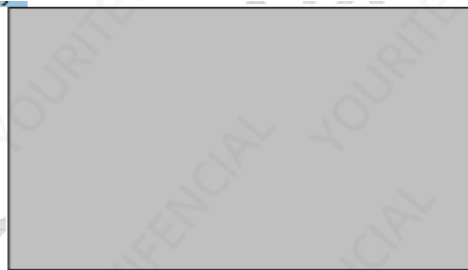


Image Sticking -pattern



Mid-Gray pattern

9.2 Shock and Vibration

ITEMS	CONDITIONS
Shock (Non-Operation)	- Shock level: 980m/s² (equal to 100G). - Waveform: 1/2 Sine wave, 6msec ±X; ±Y; ±Z; each axis 1 times
Vibration (Non-Operation)	- Frequency range: 8~33.3Hz - Stroke: 1.3mm - Vibration: sinusoidal wave, perpendicular axis (both x, z axis: 2Hrs, y axis 4Hrs). - Sweep : 2.9G, 33.3 Hz -400 Hz - Cycle: 15 min

9.3 Electrostatic Discharge

TEST ITEM	Conditions	NOTE
ESD test (operating)	Air Voltage: ±8KV Contact Voltage: ±4KV R: 330Ω C: 150pF 5 time , Surface of AA area 9 point ClassB	

Note

Class B , 有异常而可恢复, 比如闪屏, 因为整机ESD水平不仅与模组相关, 也与系统相关。此处承诺配合客户整机达到要求, 如需要将进行ESD改善。



9.4 Judgment Standard

The Judgment of the above test should be made as follow:

Pass: Normal display image and no line defect.

Partial transformation of the module parts should be ignored.

Fail: No display image, function NG, or line defects.

10. WARRANTY

11.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

11.2 The warranty will be avoided in case of defect induced by customer.



11. APPEARANCE SPECIFICATION

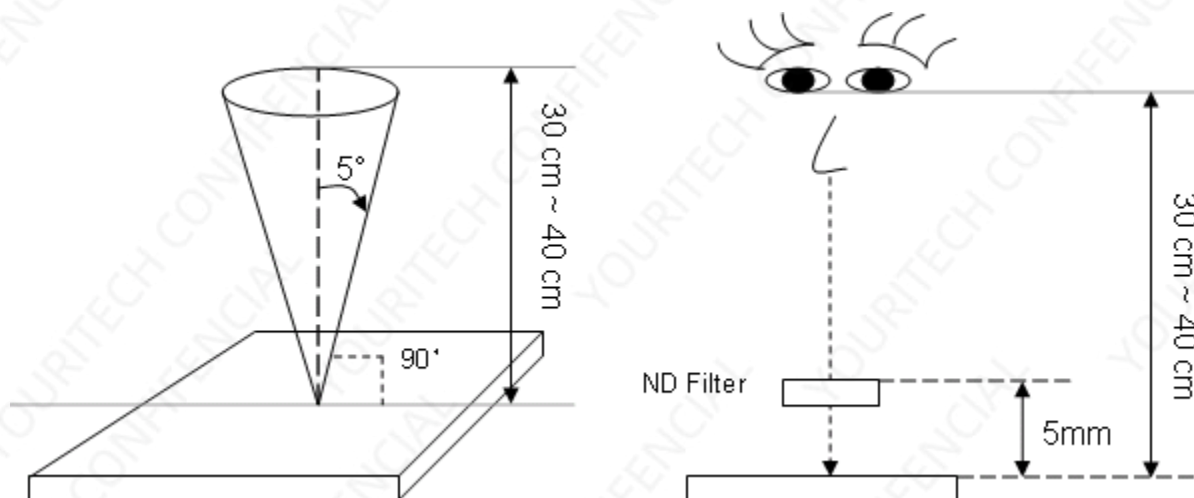
11.1.1 Inspection conditions

12.1.1.1 Inspection Distance : 35 ± 5 cm

12.1.1.2 View Angle :

(1) Inspection under operating condition: ± 5

(2) Inspection under non-operating condition: ± 45

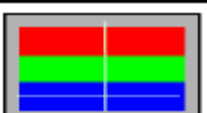


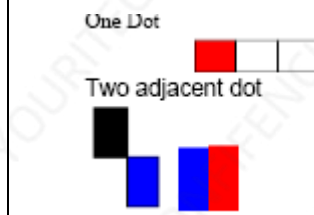
12.1.2 Environment conditions :

Ambient Temperature :	$25 \pm 5^{\circ}\text{C}$
Ambient Humidity :	30~75%RH
Ambient Illumination	600~800 lux

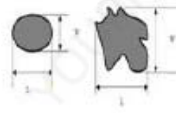
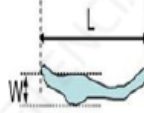
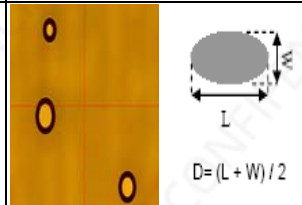
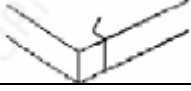
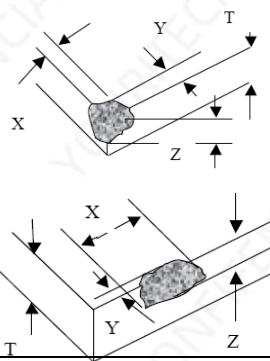
11.2 Inspection Parameters

Appearance and Functional Inspection Criteria (D: diameter, L: length; W: width, Z: height, T: glass thickness, n: number)

Inspection item	Inspection standard	Description
No image	Prohibited	
Image abnormal	Prohibited	
Bright line	Prohibited	
Mura	It is acceptable that the defect can not be seen with 2% ND filter.	

Dot	Item	Acceptable	Total	
		Visible area		
Bright dot	3	6		
Dark dot	5			
Bright adjacent dots	1	1		
Dark adjacent dots	2	2		
Adjacent dots with a bright	2	2		



	dot and a dark dot		
Foreign material in dot shape	SPEC (unit: mm)	Acceptable	 D= (L + W) / 2
	D ≤ 0.5	Ignored	
	0.5<D ≤ 0.8, distance>5	n ≤ 5	
	D > 0.8	0	
Foreign material in line shape	SPEC(unit: mm)	Acceptable	 L : Long W : Width
	W ≤ 0.05 and L ≤ 10	Ignored	
	0.05<W ≤ 0.1, L ≤ 10, distance >5	n ≤ 5	
	W>0.1 or L>10	0	
Contamination	It is acceptable if the dirt can be wiped.		
Inspection item	Inspection standard		Description
Scratch	SPEC (unit: mm)	Acceptable	
	W ≤ 0.05 and L ≤ 10	Ignored	
	0.05<W ≤ 0.08, L ≤ 10, distance >5	n ≤ 5	
	0.08<W ≤ 0.1, L ≤ 10, distance >5	n ≤ 3	
	W>0.1 or L>10	0	
Bubble	SPEC (unit: mm)	Acceptable	 D= (L + W) / 2
	D ≤ 0.3	Ignored	
	Non visible area	Ignored	
	0.3<D ≤ 0.5, distance >5	n ≤ 5	
	D > 0.5	0	
Insufficient glue	SPEC (unit: mm)	Acceptable	
	Non visible area	Ignored	
	Visible area	0	
Cover & Sensor Crack	Prohibited		
Sensor angle missing & edge break	SPEC (unit: mm)	Acceptable	
	Damage circuit or effect function	0	
Cover/Sensor angle missing	SPEC (unit: mm)	Acceptable	
	X ≤ 3.0, Y ≤ 3.0, Z ≤ T	Ignored	
	X > 3.0, Y > 3.0, Z > T	0	
Cover/Sensor edge break	SPEC (unit: mm)	Acceptable	
	X ≤ 3.0, Y ≤ 3.0, Z ≤ T	Ignored	
	X > 3.0, Y > 3.0, Z > T	0	
Ink	SPEC (unit: mm)	Acceptable	
	word unclear, inverted, mistake, break line	0	
Bubble under protection film	SPEC (unit: mm)	Acceptable	
	NA		
Function	Prohibited		
If FPC was bended and the back turns to white, classify it to be NG,otherwise,classify it to be OK			

If FPC was bended and the back turns to white, classify it to be NG, otherwise, classify it to be OK

11.3 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

Sampling table: ISO 2859

Your Reliable Display Panel and Touch Embedded Solution Enterprise



For more information about comprehensive display panel and touch embedded solution, welcome contact us at:

<https://www.youritech.com>
info@youritech.com

Inspection level: Level II

Class of defects	Definition		
	Major	AQL 0.65	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5	It is a defect that will not result in functioning problem with deviation classified.

12. QUALITY ASSURANCE

12.1 Test Condition

12.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $65 \pm 5\%$

12.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

12.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

12.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

