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PRODUCT SPECIFICATION

MODEL: ET103BA01-H

<> PRELIMINARY SPECIFICATION

<◆> APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED



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Revision History

Version	Date	Page (New)	Section	Description	Revision by
01	2024/09/23	-	All	Preliminary Specification	



1. GENERAL DESCRIPTION

1.1 General Description

The specification is applied to 10.25 inch model (ET103BA01-H) TFT Liquid Crystal Display.

The matrix uses a-Si Thin Film Transistor as a switching device. This TFT LCD has a 10.25 inch diagonally measured active display area with resolution 1280*480. All input signals are LVDS interface compatible.

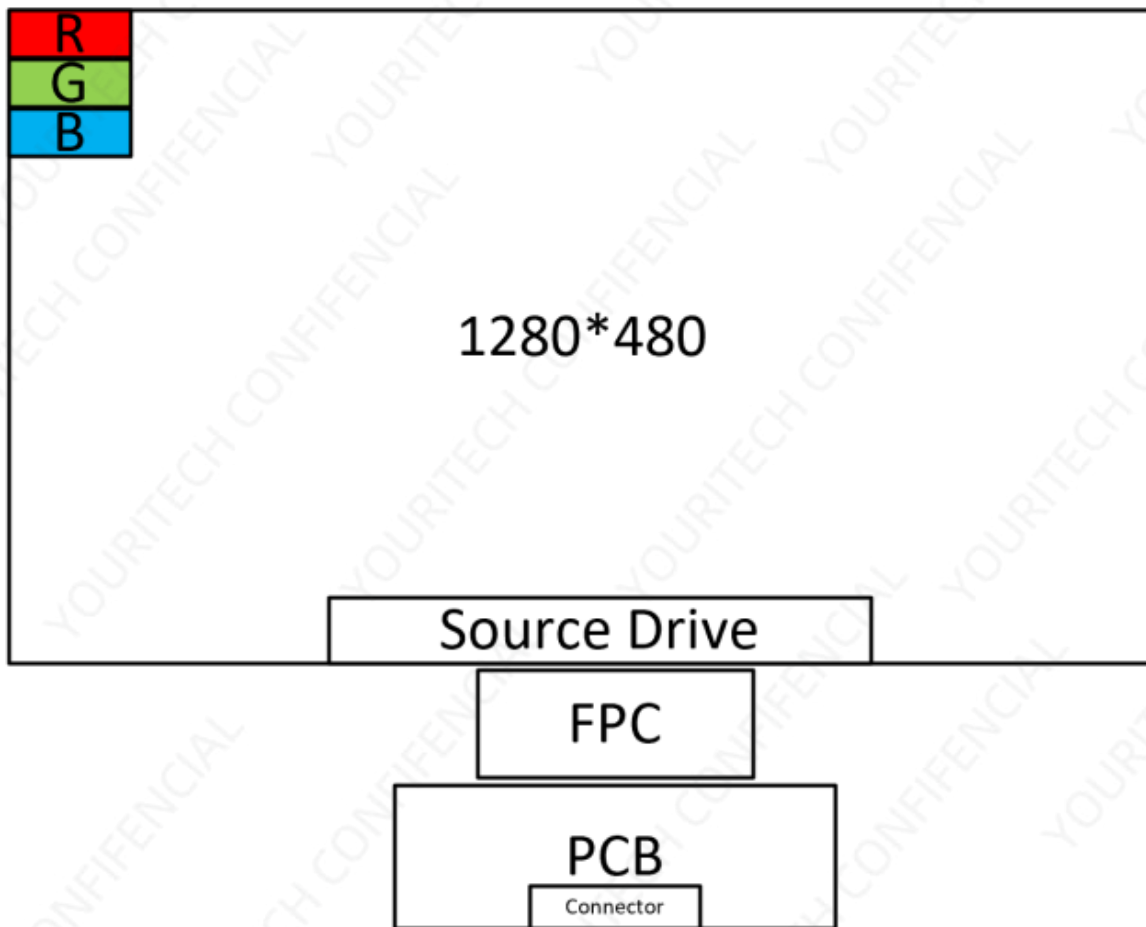


Figure 1. Drive Architecture

1.2 Features

- (1) 1 Port LVDS interface
- (2) 16.7M (8bit) color depth, color gamut 70%
- (3) Green product (RoHS & Halogen free product)



1.3 General Specifications

The followings are general specifications at the model ET103BA01-H. (listed in Table 1)

Table 1.General Specifications

Item	Specification	Unit	Note
Active area	243.84(H) x 91.44(V)	mm	-
Number of pixels	1280(H) ×480(V)	pixels	-
Pixel pitch	0.1905 (H) ×0.1905(V)	mm	-
Pixel arrangement	RGB Horizontal stripe	-	-
Display colors	16.7M(8bits)	-	-
Color gamut	NTSC (70%) min	%	-
Display mode	Normally black	-	-
Outline Dimension	258.6*107.0*6.31	mm	-
Input Data	LVDS		
Viewing Direction	ALL	-	-



2. ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Maximum Ratings

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

Table 2.Absolute Maximum Ratings

Ta=25+/-5°C

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	3.0	3.6	V	(1),(2),(3),(4)
Logic Supply Voltage	V _{IN}	- 0.3	VCC	V	
Operating Temperature	T _{OP}	-40	85	°C	
Storage Temperature	T _{ST}	-40	95	°C	

Note (1) All the parameters specified in the table are absolute maximum rating values that may cause faulty operation or unrecoverable damage, if exceeded.

Note (2) All the contents of electro-optical specifications and display fineness are guaranteed under Normal Conditions. All the display fineness should be inspected under normal conditions. Normal conditions are defined as follow: Temperature: 25°C, Humidity: 50± 10%RH.

Note (3) Unpredictable results may occur when it was used in extreme conditions. T_a= Ambient Temperature, T_{gs}= Glass Surface Temperature. All the display fineness should be inspected under normal conditions.

Note (4) Temperature and relative humidity range are shown in the figure below, it should be noticed that only functional uses can be guaranteed from -40°C to -30°C.

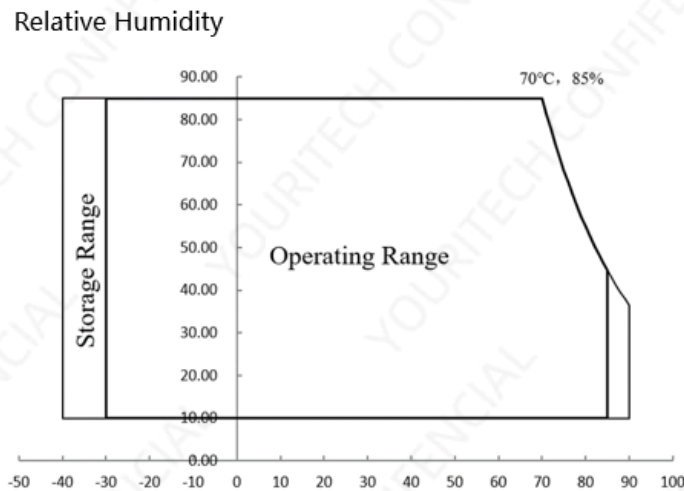


Figure 3. Absolute Ratings of Environment of the LCD Module



3. ELECTRICAL SPECIFICATIONS

3.1 Interface Connector

Table 3. Signal Connector Type

Item	Description
Manufacturer / Type	Molex/5051103091

Table 4. Signal Connector Pin Assignment

PIN NO.	SIGNAL NAME	DESCRIPTION
1	VDD_OTP	Power input only for OTP programming (8.6V) Leave this pin open or connect it to VCC when not programming OTP.
2	GND	Ground
3	STBYB	Standby mode setting pin, active low. Timing controller, output buffer, DAC and power circuit of source IC all off when STBYB is low.
4	RESETB	Global reset pin, active low. If it connected to VSS, the controller is in reset state.
5	FAIL_DET	Fail detection signal output
6	GND	Ground
7	D3_P	Data channel 3 +
8	D3_N	Data channel 3 -
9	GND	Ground
10	CLK_P	Clock channel +
11	CLK_N	Clock channel -
12	GND	Ground
13	D2_P	Data channel 2 +
14	D2_N	Data channel 2 -
15	GND	Ground
16	D1_P	Data channel 1 +
17	D1_N	Data channel 1 -
18	GND	Ground
19	D0_P	Data channel 0 +
20	D0_N	Data channel 0 -



21	GND	Ground
22	GND	Ground
23	VCC	Power input pin
24	VCC	Power input pin
25	GND	Ground
26	SPI_CSB	Serial Interface chip enable signal for SPI interface. SPI_CSB=0: Selected (Accessible). SPI_CSB=1: Not selected (Inaccessible). Connect it to VCC level when not used.
27	SPI_SCL	Serial interface clock input for SPI interface. Connect it to GND level when not used.
28	SPI_SDAO	Serial interface address and data output for SPI interface. Leave this pin open when not used.
29	SPI_SDAI	Serial interface address and data input for SPI interface. Connect it to GND level when not used.
30	GND	Ground

3.2 Signal Electrical Characteristics

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

Table 5. LVDS Receiver Input DC Specifications

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Differential input high Threshold voltage	V_{TH}	$V_{CM}=1.2V$	+0.10	-	-	V
Differential input low threshold voltage	V_{TL}	$V_{CM}=1.2V$	-	-	-0.10	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



Figure 6. LVDS DC electrical characteristics

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

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

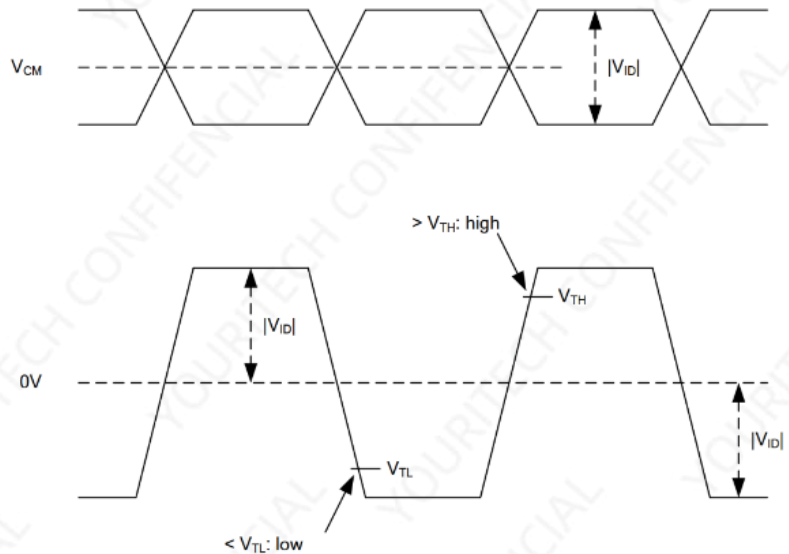
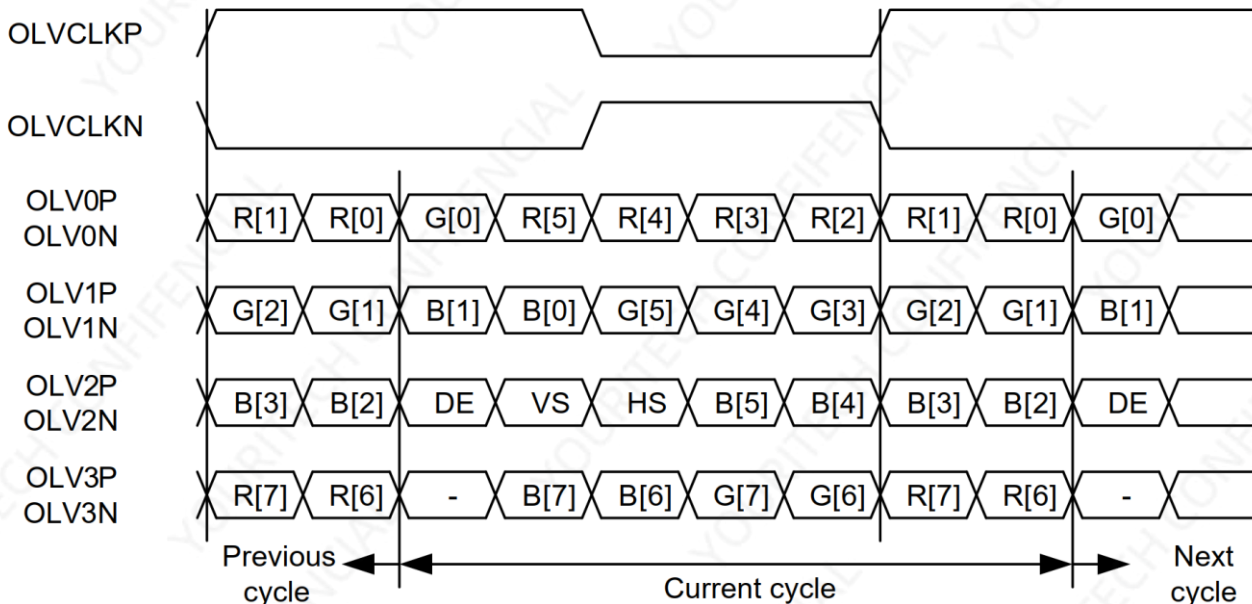


Figure 7. 1-port LVDS signals, VESA format (8-bit)

For 1-port LVDS 8-bit mode with VESA format, only the odd port (with OLVxxx pins) is used.



3.3 Interface Timings



Table 8. Interface Timings

Parameter	Symbol	1280x480			Unit
		Min	Typ	Max	
DCLK Frequency	F_{DCLK}		42.18		MHz
Horizontal Valid data	t_{hd}	1280			DCLK
Hsync pulse Width	t_{hpw}	6	12	254	DCLK
Hsync back porch	t_{hbp}	5	16	255	DCLK
Hsync front porch	t_{hfp}	51	56	-	DCLK
1 horizontal line	t_h	1336	1352	1920	DCLK
Vertical Valid data	t_{vd}	480			Line
Vsync pulse Width	t_{vpw}	1	3	254	Line
Vsync back porch	t_{vbp}	6	24	255	Line
Vsync front porch	t_{vfp}	13	16	-	Line
1 vertical field	t_v	499	520	750	Line
Frame rate	FR		60		Hz

3.4 Input Power Specifications

Input power specifications are as follows.

Table 9. Input Power Specifications

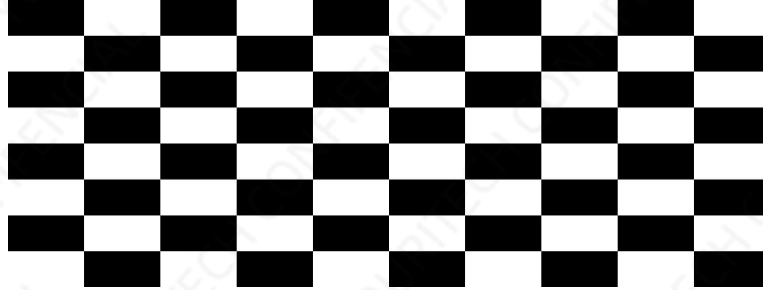
Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
System Power Supply							
LCD Drive Voltage (Logic)		V_{CC}	3	3.3	3.6	V	(1),(2)
Vcc Current	mosaic Pattern	I_{VCC}	-	0.25	-	A	(1),(3)
Vcc Power Consumption	mosaic Pattern	P_{VCC}	-	0.9	-	W	
Rush Current		I_{rush}	-	-	1.0	A	(1),(4)
Allowable Logic/LCD Drive Ripple Voltage		V_{VCC-RP}	-	-	200	mV	(1)

Note (1)All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25°C, Humidity: 50± 10%RH.



Note (2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage. It is recommended to follow the typical value.

Note (3) The specified V_{CC} current and power consumption are measured under the $V_{CC} = 3.3V$, $F_V = 60Hz$ condition and 10*8 mosaic Pattern.



Note (4) The figures below is the measuring condition of VDD Rush current can be measured when T_{rush} is 0.5ms.

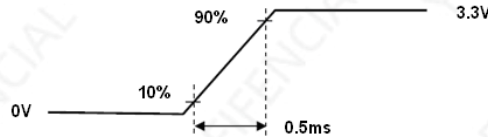


Figure 4. VDD Rising Time

3.5 Power ON/OFF Sequence(B/L Ref.)

Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD voltage is off.

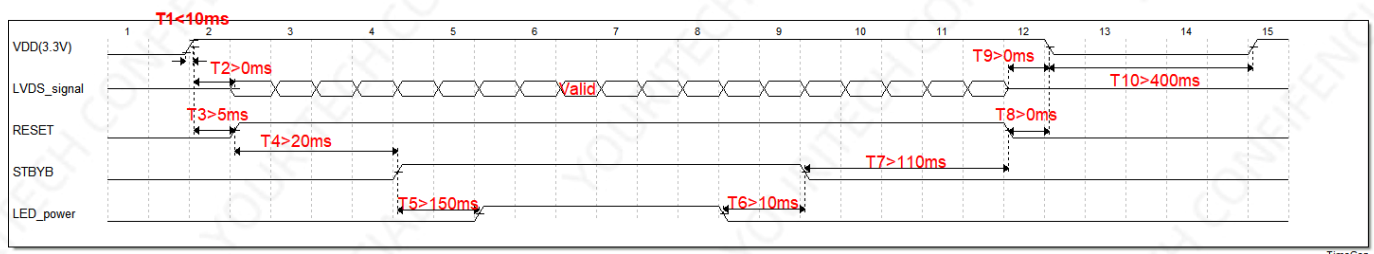


Figure 5. Power-on/off Sequence



4. OPTICAL SPECIFICATION

4.1 The table below is the test condition of optical measurement.

Table 10. Test condition of optical measurement

Item	Symbol	Value	Unit
Ambient Temperature	TA	23	°C
Ambient Humidity	HA	50	% RH
Supply Voltage	V _{DD}	3.3	V
Driving Signal	Refer to the typical value in Chapter 3: ELECTRICAL SPECIFICATIONS		
Vertical Refresh Rate	Fv	60	Hz
Warm up time	Twarm	>15 min	min
Dark room	ED	<1 lux	lux

4.2 Optical Specifications

Table 11. Optical Specifications

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Chromaticity (CIE1931 C-light)	Red	R _x	θ _x =0°,θ _y =0°	Typ. (-0.05)	(0.659)	Typ. (+0.05)	-	(1)
		R _y			(0.325)			
	Green	G _x			(0.294)			
		G _y			(0.617)			
	Blue	B _x			(0.131)			
		B _y			(0.125)			
	White	W _x			(0.307)			
		W _y			(0.335)			
Color Gamut		CG	70	-	-	%	-	
Contrast Ratio		CR	θ _x =0°,θ _y =0°	1000:1	1200:1	-	-	(2)
Response Time		T _g =25°C	θ _x =0°,θ _y =0°	-	-	20	ms	(3)
		T _g =-20°C		-	-	180	ms	
		T _g =-30°C		-	-	350	ms	
Viewing Angle	Horizontal	θ _x +	CR> 10	85	-	-	Deg.	(4)
		θ _x -		85	-	-		
	Vertical	θ _y +		85	-	-		
		θ _y -		85	-	-		
Brightness		L _v		800	1000	-	cd/ m²	
Uniformity		U		75			%	



Notes:

(1) The chromaticity coordinates specified in Table 10 should be calculated from the measurement spectrum of all pixels in red, green, blue, and white, and should be measured at the center of the panel.

(2) Definition of Contrast Ratio (CR):

(3) The contrast ratio can be calculated by the following formulation

(4) Contrast Ratio (CR): $CR = \frac{CR_w}{CR_D}$

(5) CRW : Luminance of LCD module with full screen white pattern (255,255, 255) at center point.

(6) CRD : Luminance of LCD module with full screen Dark pattern (0, 0, 0) at center point.

(3) Definition of Response time (RT):

The response time is defined as the LCD optical switching time interval between “Bright state” and “Dark state”, TR is the rise time between Luminance rate changed from 10% to 90%, TF is the fall time between Luminance rate changed from 90% to 10%. RT should be measured at atmosphere temperature at center point.

<Table 12. Switching time of luminance ratios matrix>

Measured Response time		To	
		10%	90%
From	10%		$T_{10\%to90\%}$
	90%	$T_{90\%to10\%}$	

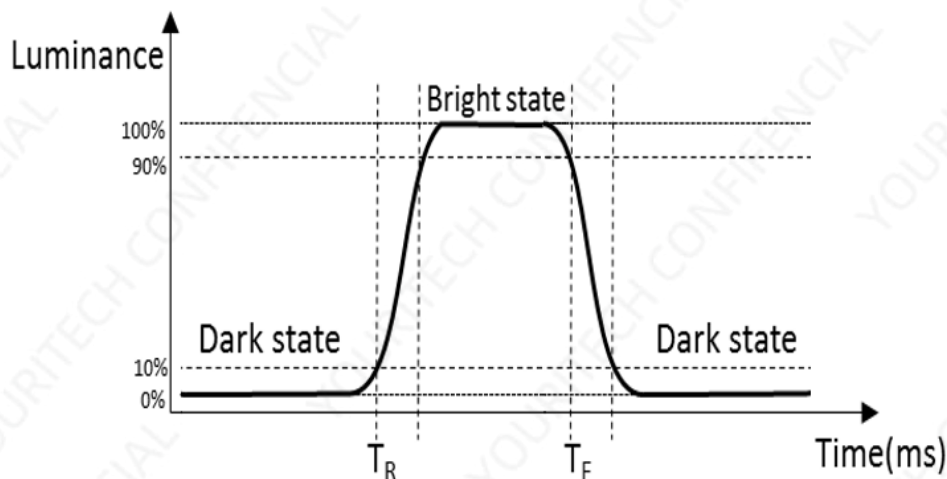


Figure 6. The definition of TR and TF

Measured response time is determined by rise time (T_R) and fall time (T_F) at ambient temperature, and shown in Figure 8

(4) Definition of Viewing angle:



As CR definition stated in Note (4), the viewing angles are defined when the viewing angle is larger than 10° in four directions relative to the perpendicular direction of the HKC's module (two vertical angles: up θ_{y+} and down θ_{y-} ; and two horizontal angles: right θ_{x+} and left θ_{x-}). The standard setup of measurement is shown in Figure 9.

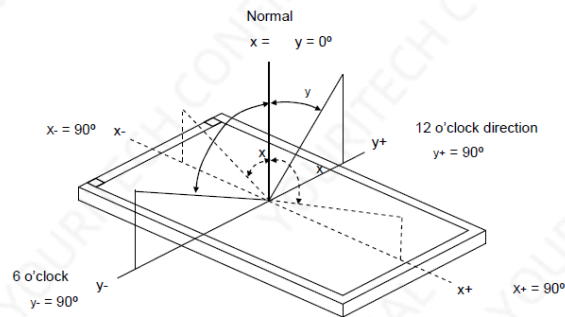


Figure 7. Definition of Viewing angle

4.3 Optical Measurements

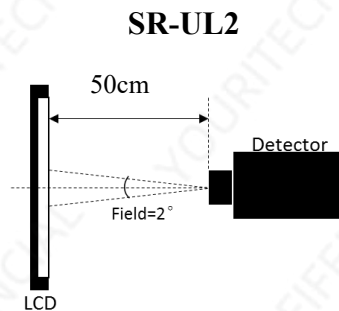


Figure 8. Measurement equipment



5. MECHANICAL OUTLINE DIMENSION

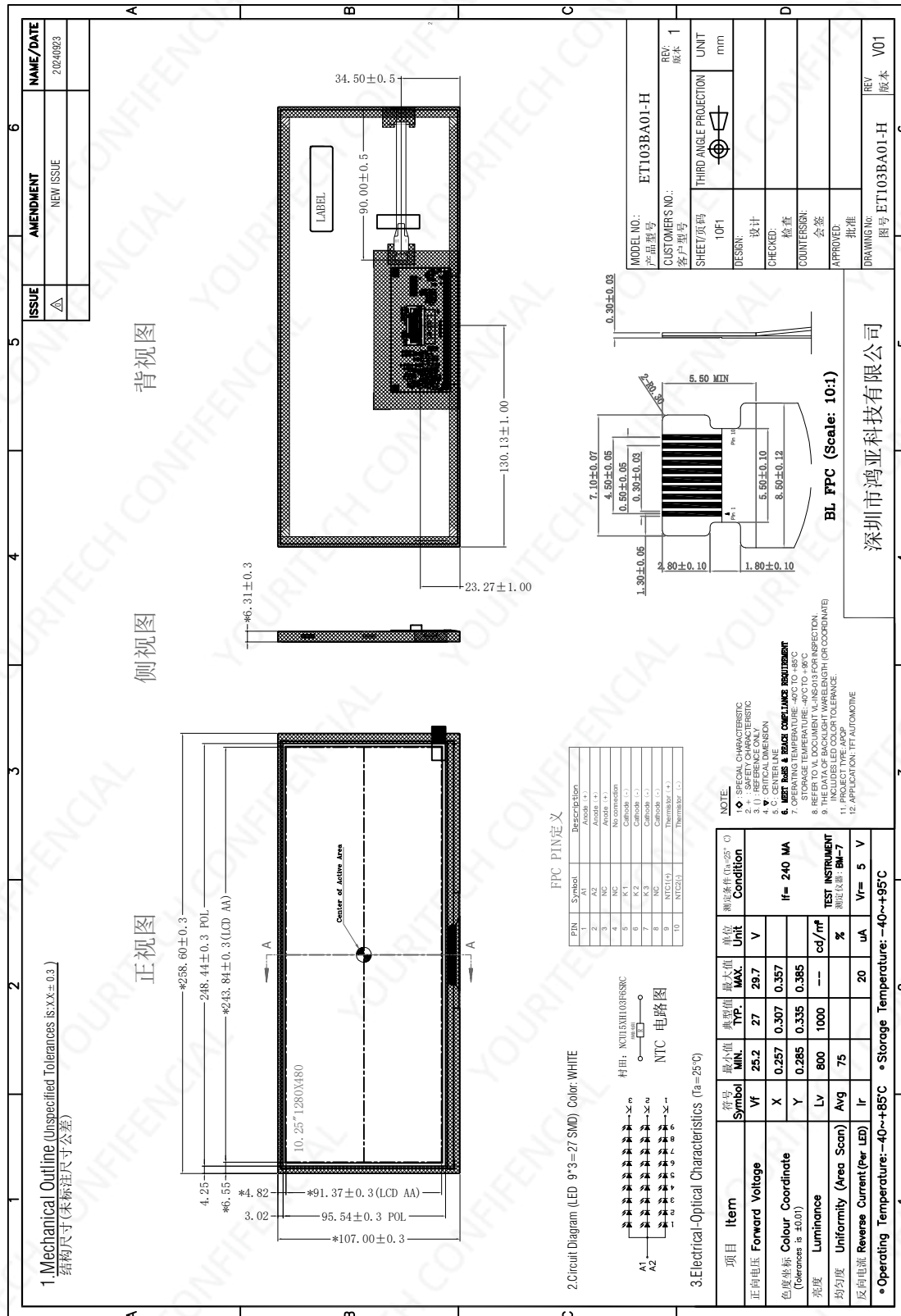


Table 13. Module Dimension Specifications

Item	Min.	Typ.	Max.	Unit
Width	258.3	258.6	258.9	mm
Height	106.7	107.0	107.3	mm
thickness	6.01	6.31	6.61	mm

Note:

Outline dimension measure instrument: Vernier Caliper.

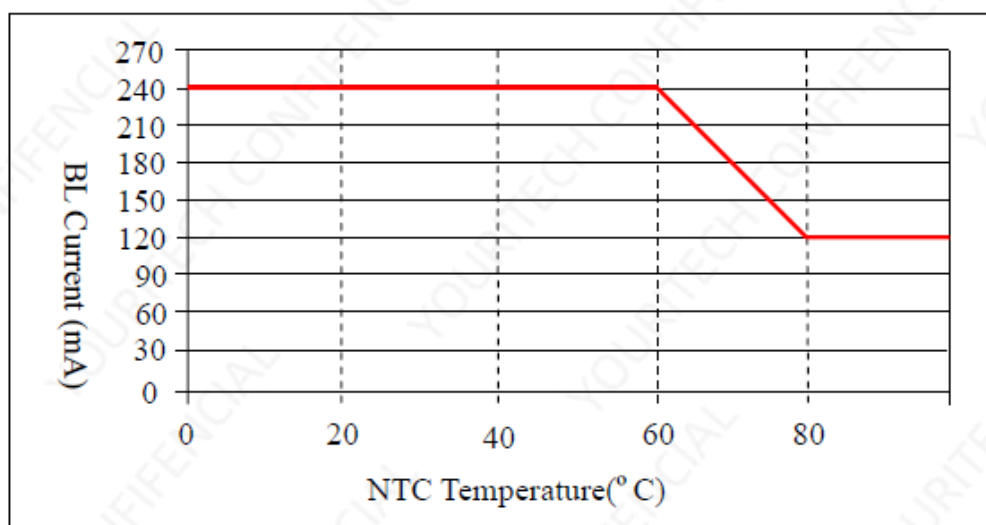
Back-Light Unit

The backlight system is an edge-lighting type with 9C * 3P=27 LED. The characteristics of the LED are shown in the following tables.

Item	Symbol	Min	Typ	Max	Unit	Note
LED current	IL	--	240	--	mA	
LED voltage	VL	25.2	27	29.7	V	
Operating LED life time	Hr	20000	--	--	Hour	(1)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm3\text{ }^{\circ}\text{C}$, typical IL value indicated in the above table and the $f_L=50\text{k}$ Hz until the brightness becomes less than 50%.

DERATING TEST



Note : The temperature at 60 degrees before the output current is 240mA. The output current dropsto 120mA from 60 degrees to 80 degrees.



6. RELIABILITY TEST

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

Table 14. Reliability Test

No	Test Items	Conditions
1	High temperature storage test	95°C, 504hrs
2	Low temperature storage test	-40°C, 504hrs
3	High temperature operating test	85°C, 504hrs
4	Low temperature operating test	-30°C, 504hrs
5	High temperature & high humidity operation test	60°C, 90%, 504hrs
6	Thermal shock	-40°(0.5hr)~85°(0.5hr)C/250cycles

Note (1) There is no display function NG issue occurred , all the cosmetic specification is judged before the reliability stress.

Note (2) after taking the samples out of the chamber and returning to room temperature and humidity, wait at least two hours before inspecting and measuring data. 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)

Note (3) The test condition definition panel's surface temperature.

Note (4) The setting of electrical parameters should follow the typical value before reliability test.

Note (5) During the test , it's unaccepted to have condensate water remains. Besides , protect the LCD from static electricity.



7. PACKAGE SPECIFICATION

TBD



8. LABEL

8.1 OC label

TBD



9.GENERAL PRECAUTION

9.1 Using Restriction

This product is not authorized for using in life supporting systems, aircraft navigation control systems, military systems and any other appliance where performance failure could be life-threatening or lead to be catastrophic.

9.2 Operation Precaution

(1)The LCD product should be operated under normal conditions.

Normal conditions are defined as below:

Temperature: 25°C

Humidity: 50±10%

Display pattern: continually changing pattern (Not stationary)

(2) Brightness and response time depend on the temperature. (It needs more time to reach normal brightness in low temperature.)

(3) It is necessary for you to pay attention to condensation when the ambient temperature drops suddenly. Condensate water would damage the polarizer and electrical contacted parts of the module. Besides, smear or spot will remain after condensate water evaporating.

(4) If the absolute maximum rating value was exceeded, it may damage the module.

(5) Do not adjust the variable resistor located on the module.

(6) Sufficient suppression to the electromagnetic interference shall be done by system manufacturers.

Grounding and shielding may be important to minimize the interference.

(7) Image sticking may occur when the module displayed the same pattern for long time.

(8) Do not connect or disconnect the module in the “power on” condition. Power supply should always be turned on/off by the “power on/off sequence”

(9) Ultra-violet ray filter is necessary for outdoor operation.

9.3 Mounting Precaution

(1) All the operators should be electrically grounded and with Ion-blown equipment turning on when mounting or handling. Dressing finger-stalls out of the gloves is important for keeping the panel clean during the incoming inspection and the process of assembly.

(2) It is unacceptable that the material of cover case contains acetic or chloric. Besides, any other material that could generate corrosive gas or cause circuit break by electro-chemical reaction is not desirable.

(3) The case on which a module is mounted should have sufficient strength so that external force is not

transmitted to the module directly.

(4) It is obvious that you should adopt radiation structure to satisfy the temperature specification.

(5) It should be attached to the system tightly by using all holes for mounting, when the module is assembled. Be careful not to apply uneven force to the module, especially to the PCB on the back.

(6) A transparent protective film needs to be attached to the surface of the module.

(7) Do not press or scratch the polarizer exposed with anything harder than HB pencil lead. In addition, don't touch the pin exposed with bare hands directly.

(8) Clean the polarizer gently with absorbent cotton or soft cloth when it is dirty.

(9) Wipe off saliva or water droplet as soon as possible. Otherwise, it may cause deformation and fading of color.

(10) Desirable cleaners are IPA (Isopropyl Alcohol) or hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(11) Do not disassemble or modify the module. It may damage sensitive parts in the LCD module, and cause scratches or dust remains. HKC does not warrant the module, if you disassemble or modify the module.

9.4 Handling Precaution

(1) Static electricity will generate between the film and polarizer, when the protection film is peeled off. It should be peeled off slowly and carefully by operators who are electrically grounded and with Ion-blown equipment turning on. Besides, it is recommended to peel off the film from the bonding area.

(2) The protection film is attached to the polarizer with a small amount of glue. When the module with protection film attached is stored for a long time, a little glue may remain after peeling.

(3) If the liquid crystal material leaks from the panel, keep it away from the eyes and mouth. In case of contact with hands, legs or clothes, it must be clean with soap thoroughly.

9.5 Storage Precaution

When storing modules as spares for long time, the following precautions must be executed.

(1) Store them in a dark place. Do not expose to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

(3) It is recommended to use it in a short-time period, after it's unpacked. Otherwise, we would not guarantee the quality.

10.6 Others

When disposing LCD module, obey the local environmental regulations.

