

**MODEL NO. : TM104SDH01****ISSUED DATE: 2009-12-16****VERSION : Ver 2.1**

- ☐ Preliminary Specification
☒ Final Product Specification

Customer :

<u>Approved by</u>	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice



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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2009-02-17	Preliminary Release	Zhenying Zhang
2.0	2009-09-14	Final Product Specification	Xing Nie
2.1	2009-12-16	Update Operating Life Time in page 7 Revise View Angles Θ T in page 12	Xing Nie



1 General Specifications

Feature		Spec
Display Spec.	Size	10.4 inch
	Resolution	800(RGB) x 600
	Interface	LVDS 6 bits
	Color Depth	262K
	Technology Type	a-Si
	Pixel Pitch (mm)	0.264x0.264
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Anti-Glare(3H)
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	236.00x176.90x5.60
	Active Area(mm)	211.20x158.40
	With /Without TSP	Without TSP
	Weight (g)	288

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2 : Requirements on Environmental Protection: Q/S0002

Note 3 : LCM weight tolerance : +/- 5%



2 Input/Output Terminals

2.1 TFT LCD Panel

Connector: Starconn 107A20-0021RA-G3-R

No	Symbol	I/O	Description	Comment
1	VDD	P	Power Supply	
2	VDD	P	Power Supply	
3	GND	P	Ground	
4	GND	P	Ground	
5	IN0-	I	LVDS receiver negative signal channel 0	
6	IN0+	I	LVDS receiver positive signal channel 0	
7	GND	P	Ground	
8	IN1-	I	LVDS receiver negative signal channel 1	
9	IN1+	I	LVDS receiver positive signal channel 1	
10	GND	P	Ground	
11	IN2-	I	LVDS receiver negative signal channel 2	
12	IN2+	I	LVDS receiver positive signal channel 2	
13	GND	P	Ground	
14	CLK-	I	LVDS receiver negative signal clock	
15	CLK+	I	LVDS receiver positive signal clock	
16	GND	P	Ground	
17	NC	-	No connection	
18	NC	-	No connection	
19	GND	P	Ground	
20	GND	P	Ground	

Note: I/O definition:

I----Input O---Output P----Power/Ground

2.2 CN2(BackLight Connector)

Connector: JST BHSR-02VS-1

No	Symbol	I/O	Description	Wire Color
1	LEDA	P	LED driving anode (high voltage)	Red
2	LEDK	P	LED driving cathode (low voltage)	White



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, $T_a = 25^{\circ}\text{C}$

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.3	5.0	V	
Input voltage	V_{IN}	-0.3	5.0	V	Note1
Operating Temperature	T_{OPR}	-20	70	$^{\circ}\text{C}$	
Storage Temperature	T_{STG}	-30	80	$^{\circ}\text{C}$	

Note1: V_{IN} represent $IN0\pm, IN1\pm, IN2\pm, CLK\pm$

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, $T_a=25^{\circ}\text{C}$

Item	Symbol	Min	Typ	Max	Unit	Remark
LVDS Differential input high threshold	V_{TH}	-	-	+100	mV	$V_{CMLVDS}=1.2\text{V}$
LVDS Differential input low threshold	V_{TL}	-100	-	-	mV	$V_{CMLVDS}=1.2\text{V}$
Differential input voltage	$ V_{ID} $	0.1	-	0.6	V	
LVDS input common mode voltage	V_{CMLVDS}	$ V_{ID} /2$	-	$1.4-(V_{ID} /2)$	V	
Input current	I_{IN}	-10	-	10	μA	
Supply Voltage	VDD	3.0	3.3	3.6	V	
Common Electrode Driving Signal	VCOM	-	4.30	-	V	Note1
Sync Frequency	FVD	-	60	70	Hz	
VDD Power Consumption	I_{DD}	-	260	380	mA	Note2

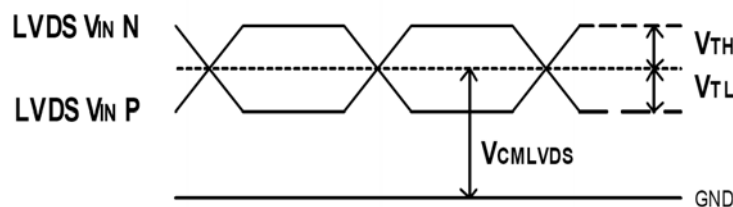


Figure 4.1.1 LVDS DC timing diagram

Note1: The value may be different for different LCM.

Note2: To test the current dissipation, using the “color bar” testing pattern shown as below:

1. White
2. Yellow
3. Cyan
4. Green
5. Magenta
6. Red
7. Blue
8. Black

1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---

Figure 4.1.2 Current dissipation testing pattern



4.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	120.0	-	mA	Note 1
Forward Current Voltage	V_F	17.7		20.7	V	Note 1
Backlight Power Consumption	WBL	-	2304	2484	mW	Note 1
Operating Life Time	--	10000	(20000)	--	hrs	Note 2

Note 1: The figure below shows the connection of backlight LED.

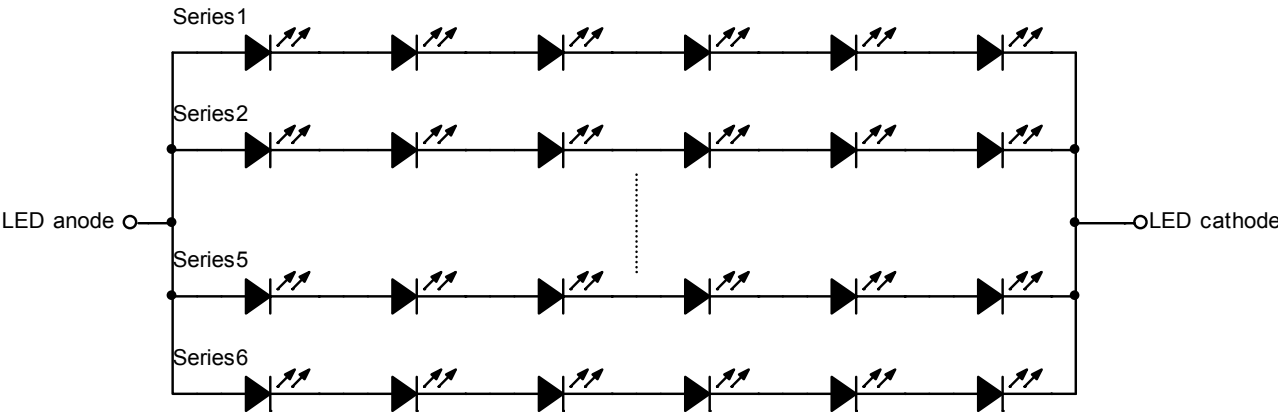


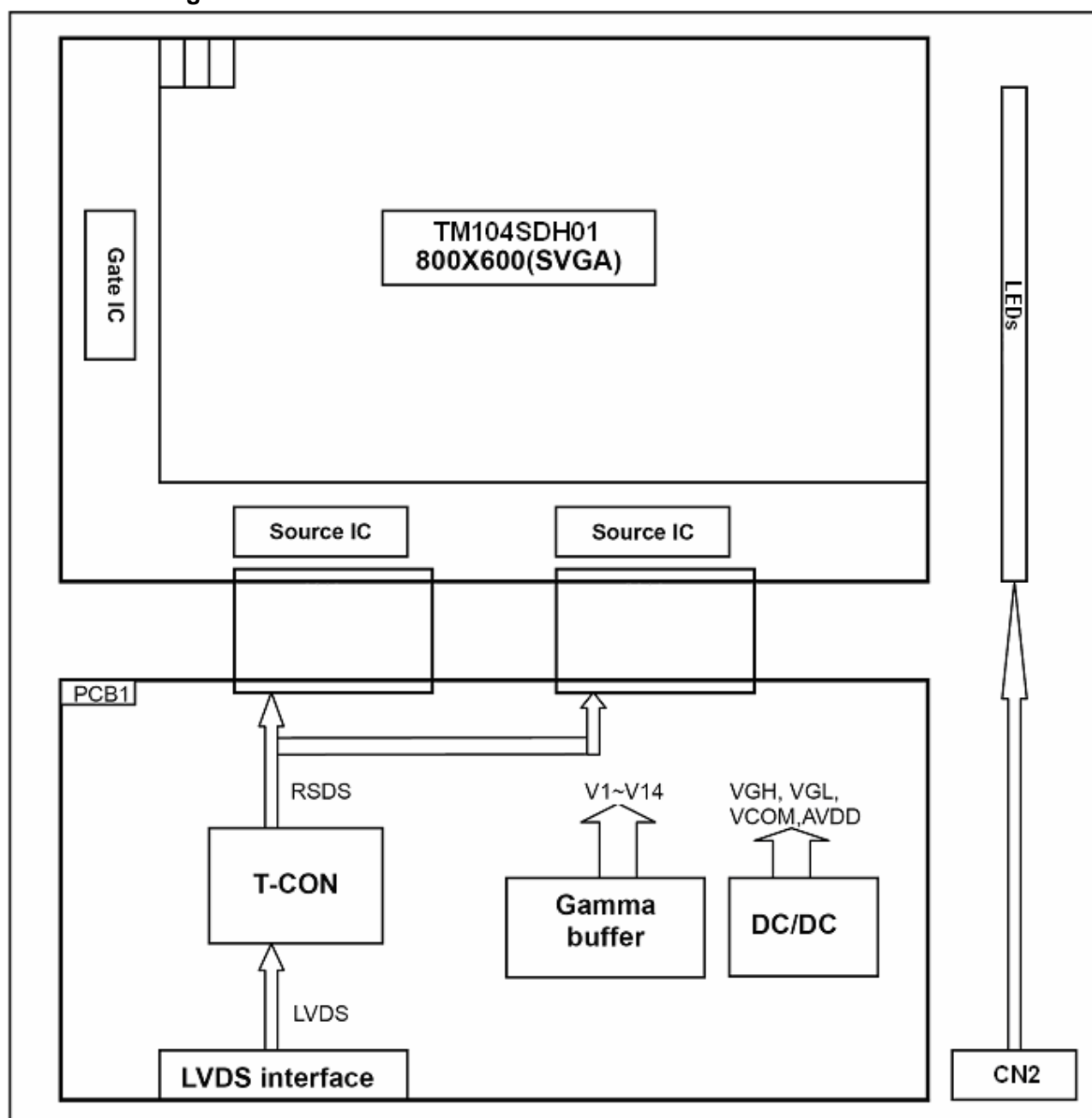
Figure 4.2 LED connection of backlight

Note 2: I_F is defined for one channel LED.
Optical performance should be evaluated at Ta=25℃ only.
If LED is driven by high current, high ambient temperature & humidity condition.
The life time of LED will be reduced.
Operating life means brightness goes down to 50% initial brightness.
Typical operating life time is estimated data.

Note 3: One LED: I_F =20mA.



4.3 Block Diagram



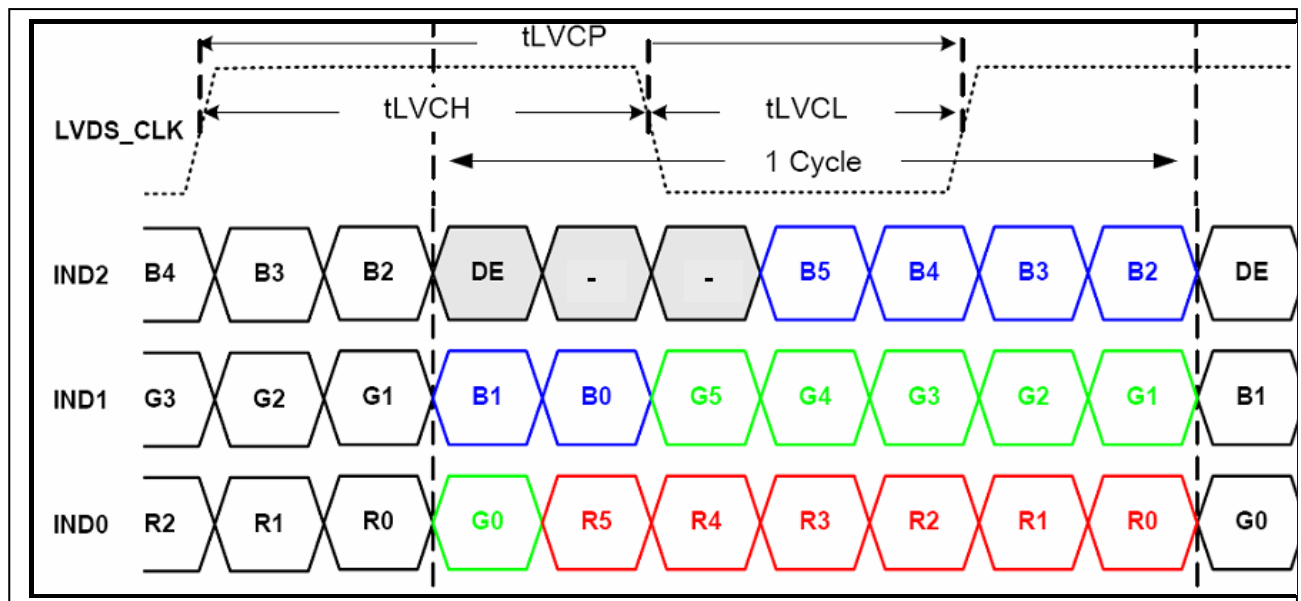
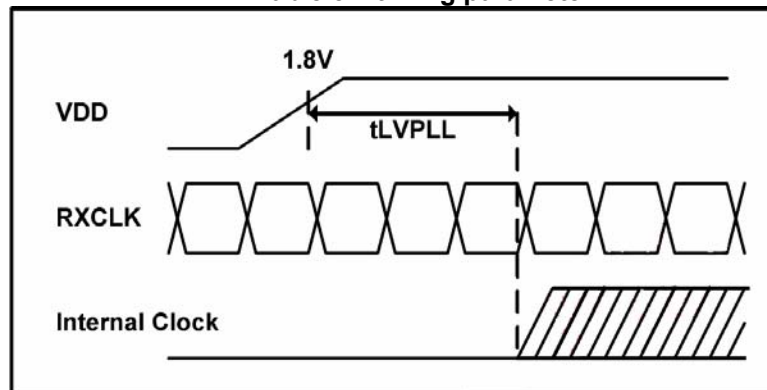


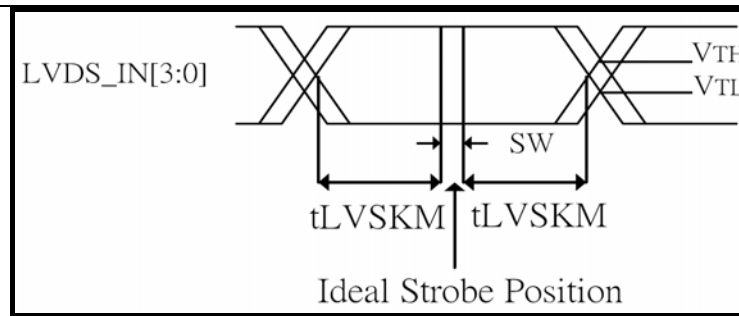
5 Timing Chart

5.1 Timing Parameter

Item	Symbol	Min	Typ	Max	Unit	Condition
Clock period	tLVCP	20.0	25	31.25	ns	
Clock high time	tLVCH	-	14.29	-	ns	
Clock low time	tLVCL	-	10.71	-	ns	
PLL wake-up time	tLVPLL	-	-	1	ms	
Input skew margin	tLVSKM	400	-	-	ps	f=85MHz

Table 5.1 timing parameter





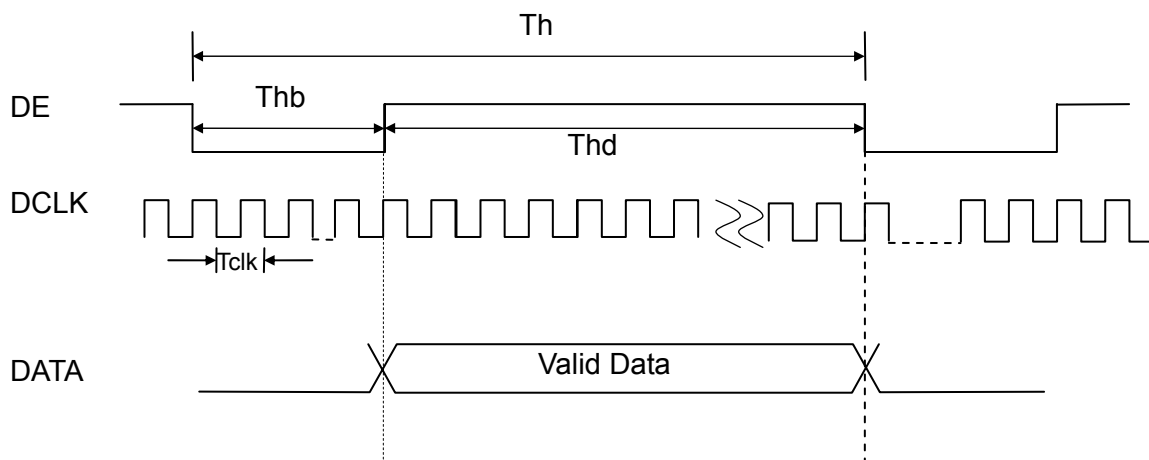
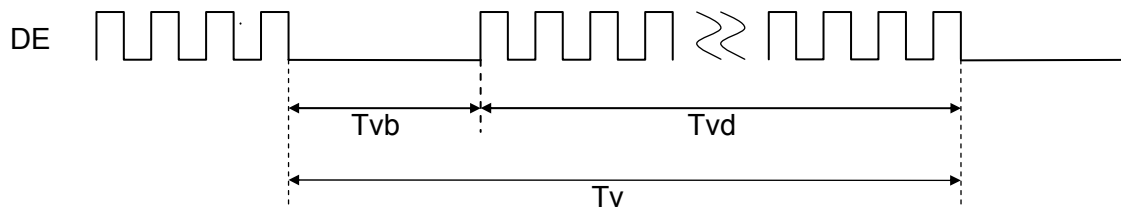
SW: Setup and Hold time
Figure 5.1 Input signal data timing

5.2 Recommended Input Timing of LVDS transmitter

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Dclk frequency		1/Tclk	32	40	50	MHz	
Horizontal section	Horizontal total	Th	866	1056	1064	Tclk	
	Horizontal blanking	Thb	66	256	264	Tclk	
	Valid Data Width	Thd	800	800	800	Tclk	
Vertical section	Frame rate	-	-	60	70	Hz	
	Vertical total	Tv	604	628	800	Th	
	Vertical blanking	Tvb	4	28	200	Th	
	Valid Data Width	Tvd	600	600	600	Th	

Note: DE signal is necessary.

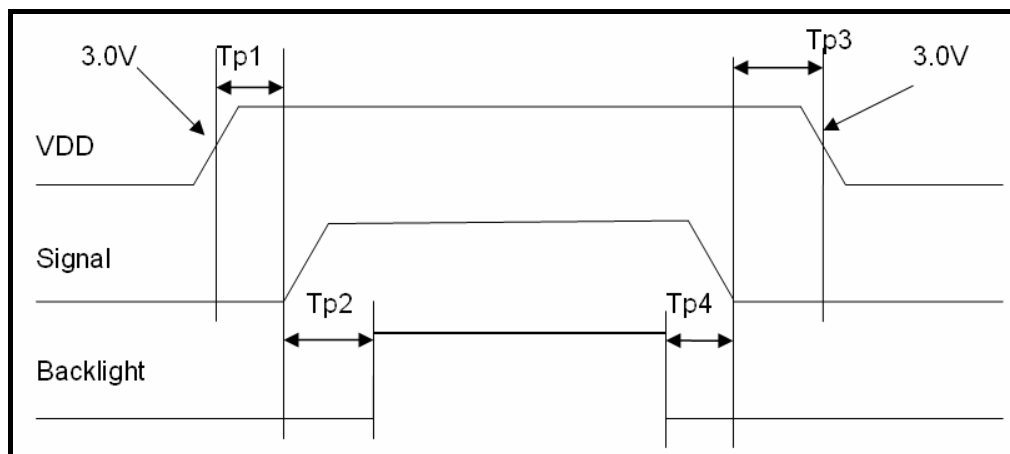
Input Timing Control Conditions



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**5.3 Power On/Off Sequence**

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD 3.0V to signal starting	Tp1	0	-	50	ms	
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VDD 3.0V	Tp3	0	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	

**Figure 5.2 Interface power on/off sequenc**



6 Optical Characteristics

6.1 Optical Specification

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	50	60	-	Degree	Note 2
		θB		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	300	400	-	-	Note1 Note3
Response Time		T _{ON}	25℃	-	10	15	ms	Note1
		T _{OFF}		-	15	25		Note4
Chromaticity	White	x	Backlight is on	0.259	0.309	0.359	-	Note5 Note1
		y		0.284	0.334	0.384		
	Red	x		0.550	0.600	0.650		
		y		0.296	0.346	0.396		
	Green	x		0.283	0.333	0.383		
		y		0.516	0.566	0.616		
	Blue	x		0.092	0.142	0.192		
		y		0.065	0.115	0.165		
Uniformity		U	-	70	80	-	%	Note1 Note6
NTSC		-	-	-	50	-	%	Note 5
Luminance		L		350	400	-	cd/m ²	Note1 Note7

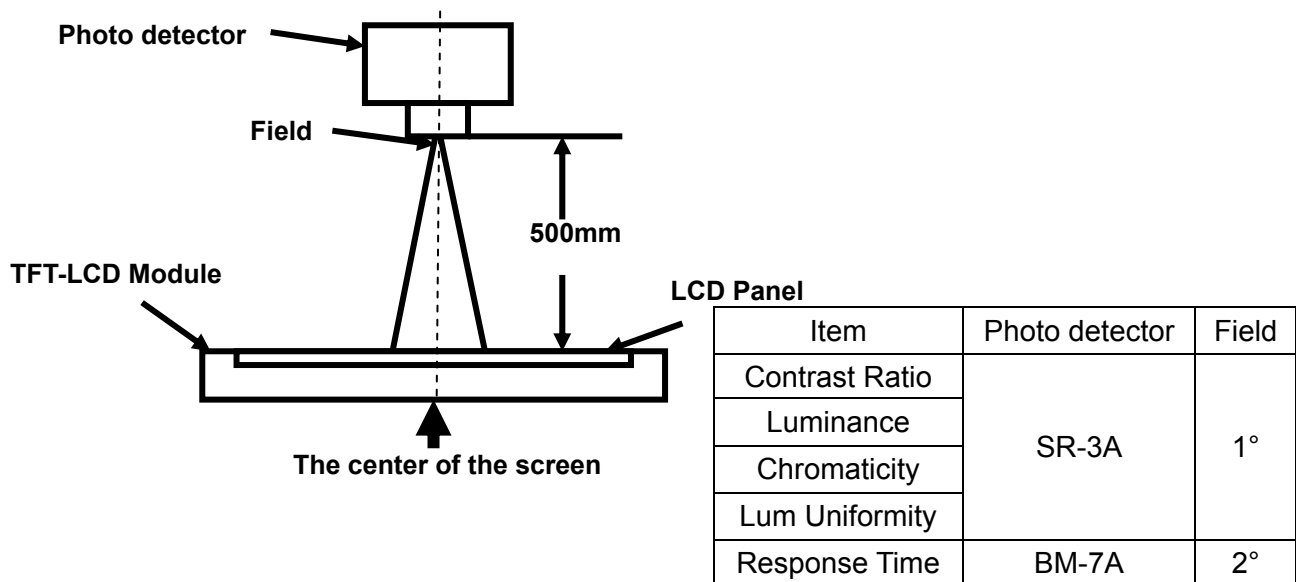
Test Conditions:

1. The ambient temperature is 25±2℃.humidity is 65±7%
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

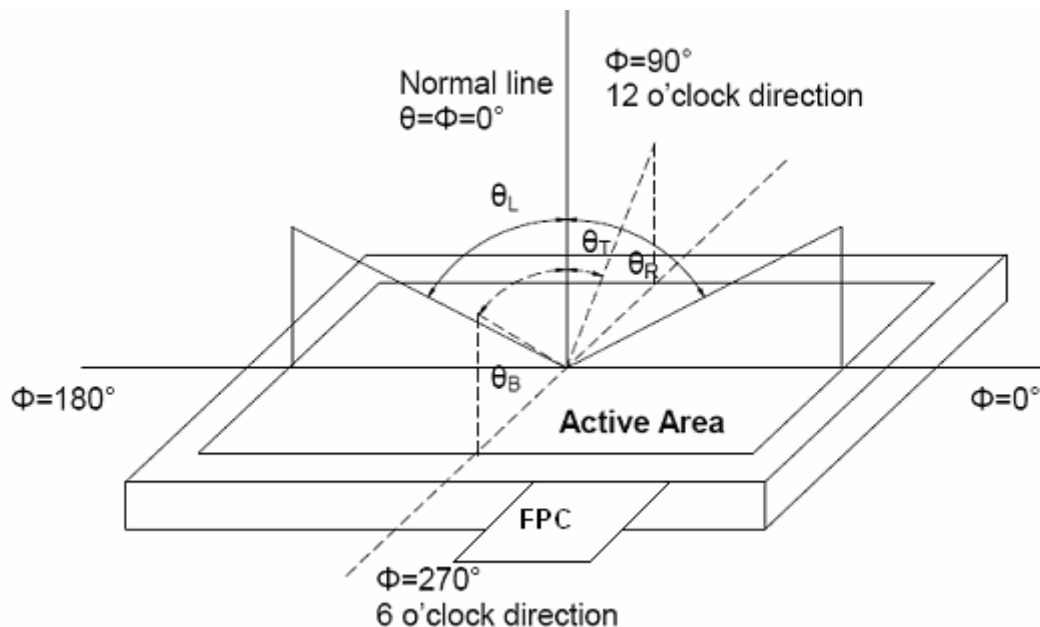


Fig. 1 Definition of viewing angle

**Note 3: Definition of contrast ratio**

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

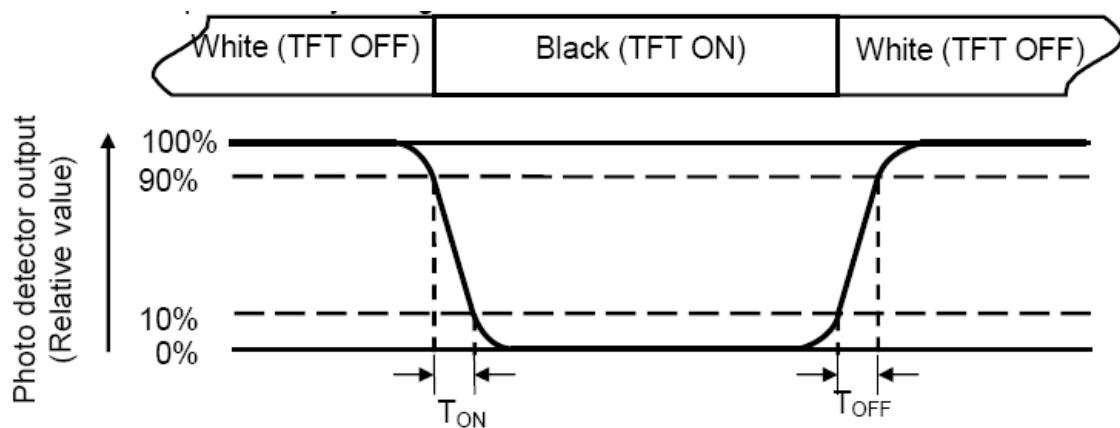
"White state": The state is that the LCD should be driven by V_{white} .

"Black state": The state is that the LCD should be driven by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

**Note 5: Definition of color chromaticity (CIE1931)**

Color coordinates measured at center point of LCD.

**Note 6: Definition of Luminance Uniformity**

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity}(U) = L_{\min} / L_{\max}$$

L-----Active area length W----- Active area width

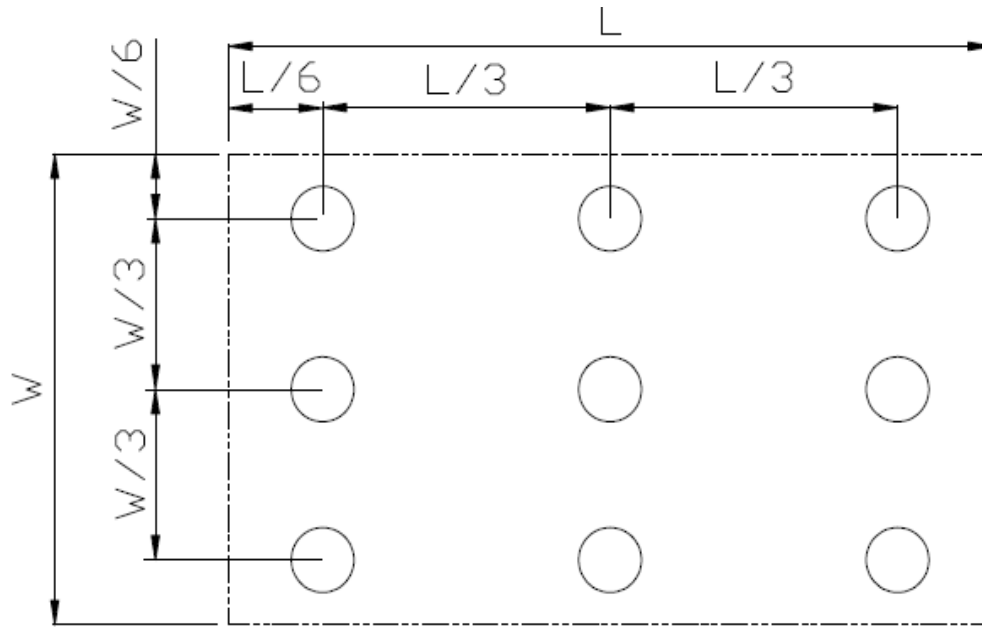


Fig. 2 Definition of uniformity

$L_{\max}$: The measured maximum luminance of all measurement position.

$L_{\min}$: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance :

Measure the luminance of white state at center point.



7 Environmental / Reliability Test

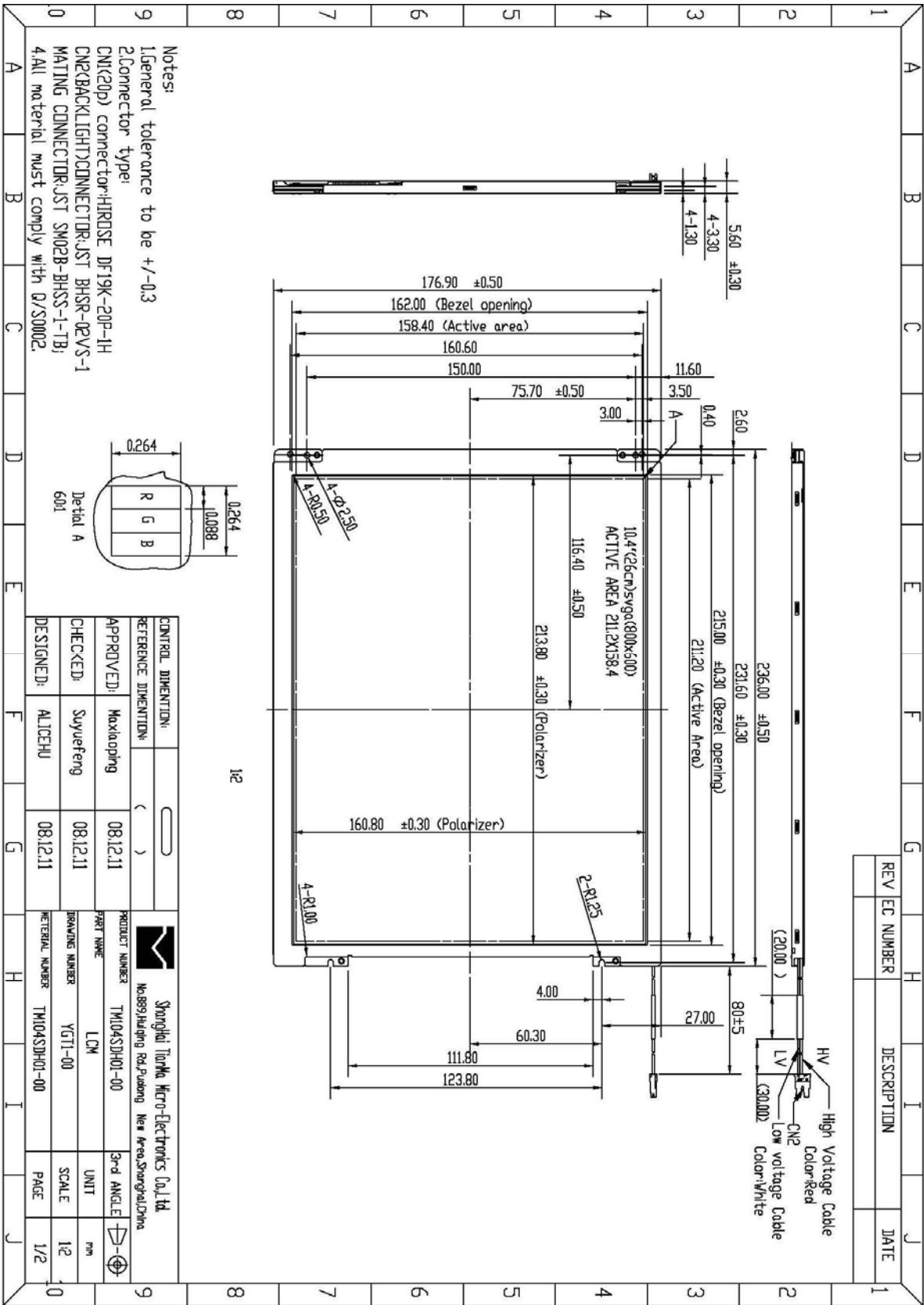
No	Test Item	Condition	Remark
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage (non-operation)	Ta=+80℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage (non-operation)	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	Note2 IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20℃ 30 min~+70℃ 30 min, Change time:5min, 100 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	Electro Static Discharge (operation)	C=150pF,R=330Ω, Air:±15Kv, Contact:±8Kv, 10times/terminal	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X.y.z (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (non-operation)	80G 6ms, ±X,±Y,±Z 3 times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995
11	Package Vibration Test	Random Vibration: 0.015GxG/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total)	IEC60068-2-34 GB/T2423.11

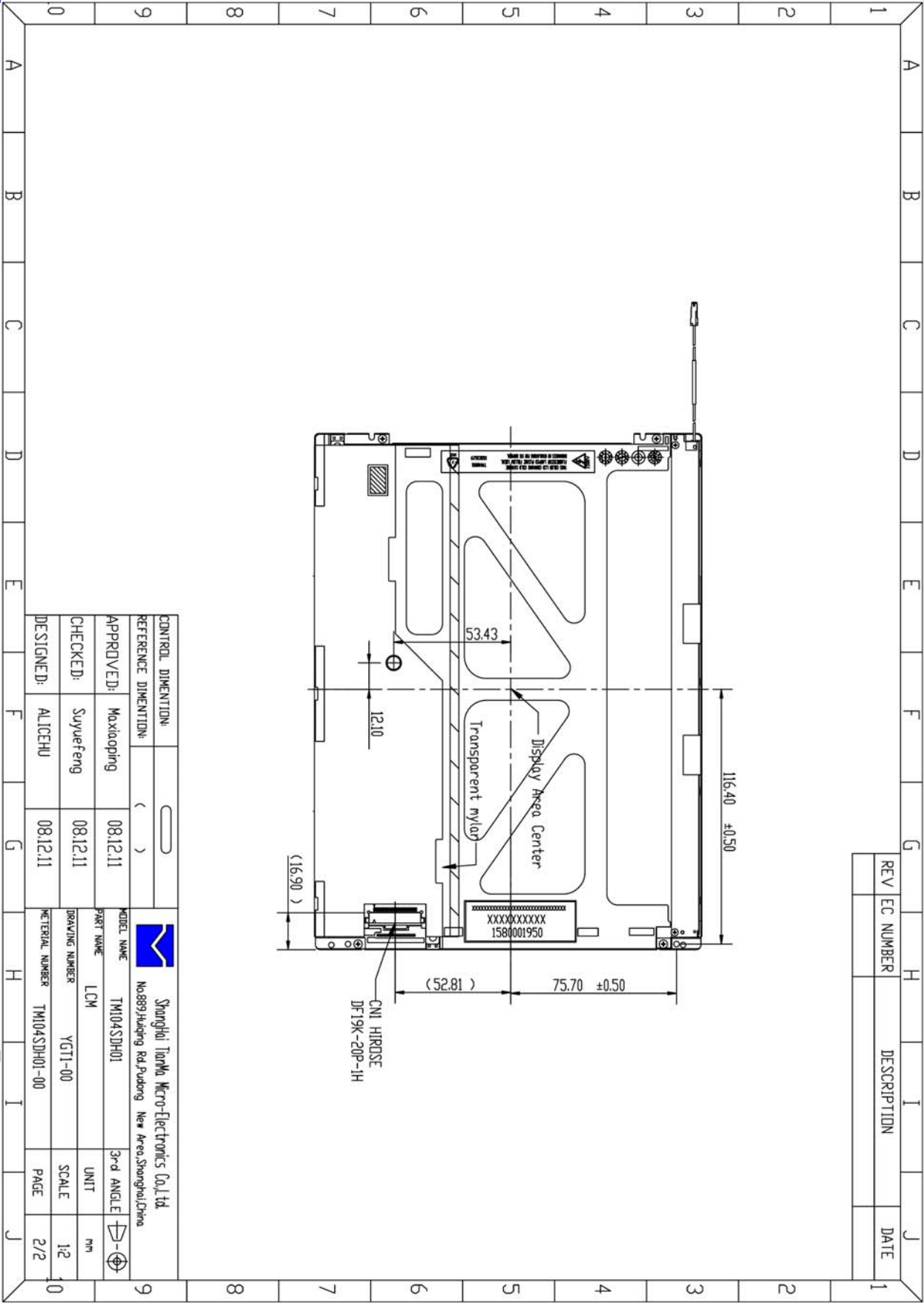
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.



8 Mechanical Drawing





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10 Precautions For Use of LCD Modules

10.1 Handling Precautions

- 10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- 10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcoholSolvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 10.1.6 Do not attempt to disassemble the LCD Module.
- 10.1.7 If the logic circuit power is off, do not apply the input signals.
- 10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 10.1.8.1 Be sure to ground the body when handling the LCD Modules.
 - 10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.
 - 10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage Precautions

- 10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:
Temperature : 0℃ ~ 40℃ Relatively humidity: ≤80%
- 10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.