上海冠显光电科技有限公司
Shanghai Top Display Optoelectronics Co., LTD

PRODUCTION SPECIFICATION OF LCD MODULE

MODULE NO.: TL026HVH03-A1147A

Customer Name:			
Customer Part Number:			
Approved By:		**Date:**	

Prepared By	Checked By	Approved By

Table of Contents

Revision History

Rev	Issued Date	Description	Page	Editor
1.0	Mar 12, 2018	First release	All	
2.0	Oct 10, 2019	Add LED life time and Reliability Remark		

1 General Specifications

Feature		Specifications
Display Spec.	LCD type	2.6 inch
	Resolution (H*V)	480(RGB)×320
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Transmissive / Normally Black
	Viewing Direction	All o' clock
	Gray Scale Inversion Direction	/
Mechanical Characteristics	OutlineDimensions (W x H x T) (mm)	59.6*47.3*2.2
	Active Area(mm)	55.01*36.67
	With /Without Touch screen	Without
	Match Connector Type	0.5pitch connector
	Backlight Type	White LED
	Weight (g)	TBD
Electrical Characteristics	Interface	3SPI
	Number of color	262K
	Driver IC	R61531

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

2 Pin Assignment

NO.	PIN NAME	I/O	Description
1	YU	I/O	Touch Panel input signal
2	XL	I/O	Touch Panel input signal
3	YD	I/O	Touch Panel input signal
4	XR	I/O	Touch Panel input signal
5	GND	P	Ground
6	IOVCC	P	Power Supply 2.8V/1.8V Voltage
7	VCI	P	Power Supply2.8V Voltage
8	NC	-	-
9	GND	P	Ground
10	RESET	I	LCM Reset input signal
11	CS	I	Input pin for chip selection signal
12	NC	-	-
13	NC	-	-
14	SCL	I	In Serial Interface, this is used as SCL.
15	NC	-	-
16	SDA	I	Date input/DO is the serial input/output signal in serial interface mode
17	SDO	I	Serial output signal.
18-31	NC	-	-
32	GND	P	Ground
33	LED_A	P	LED Anode
34	LED_K1	P	LED Cathode
35	LED_K2	P	LED Cathode
36	LED_K3	P	LED Cathode
37	LED_K4	P	LED Cathode
38	LED_K5	P	LED Cathode
39	LED_K6	P	LED Cathode
40	GND	P	Ground

Note1: I/O definition: I-----Input O---Output P----Power/Ground

3 Absolute Maximum Ratings

GND=0V, Ta= 25℃

Item	Symbol	Value	Unit
Power supply voltage for logic	V_{DD}	1.6~3.3	V
Input voltage	Vin	V_{DD}+0.3	V
Operating temperature	Topr	-20 to 70	°C
Storage temperature	Tstg	-30 to 80	°C

4 Electrical Characteristics

4.1 DC Characteristics (VDD=2.8V,Ta=25℃)

Item	Symbol	Min	Type	Max	Unit	Test condition
Operating voltage	V_{DD}	2.6	2.8	3.3	V	-
Supply current	I_{DD}	-	-	35	mA	V_{DD}=2.8V,Ta=25°C
Input voltage	V_{IH}	0.8VDD	-	VDD	V	-
	V_{IL}	0	-	0.2VDD	V	
Input leakage current	I_{IL}	-1.0	-	1.0	μA	V_{IN}=V_{DD} or V_{SS}

Note: Voltage greater than above may damage the module.

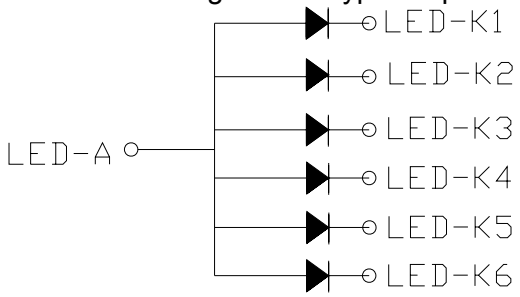
All voltages are specified relative to VSS=0V.

4.2 Driving Backlight

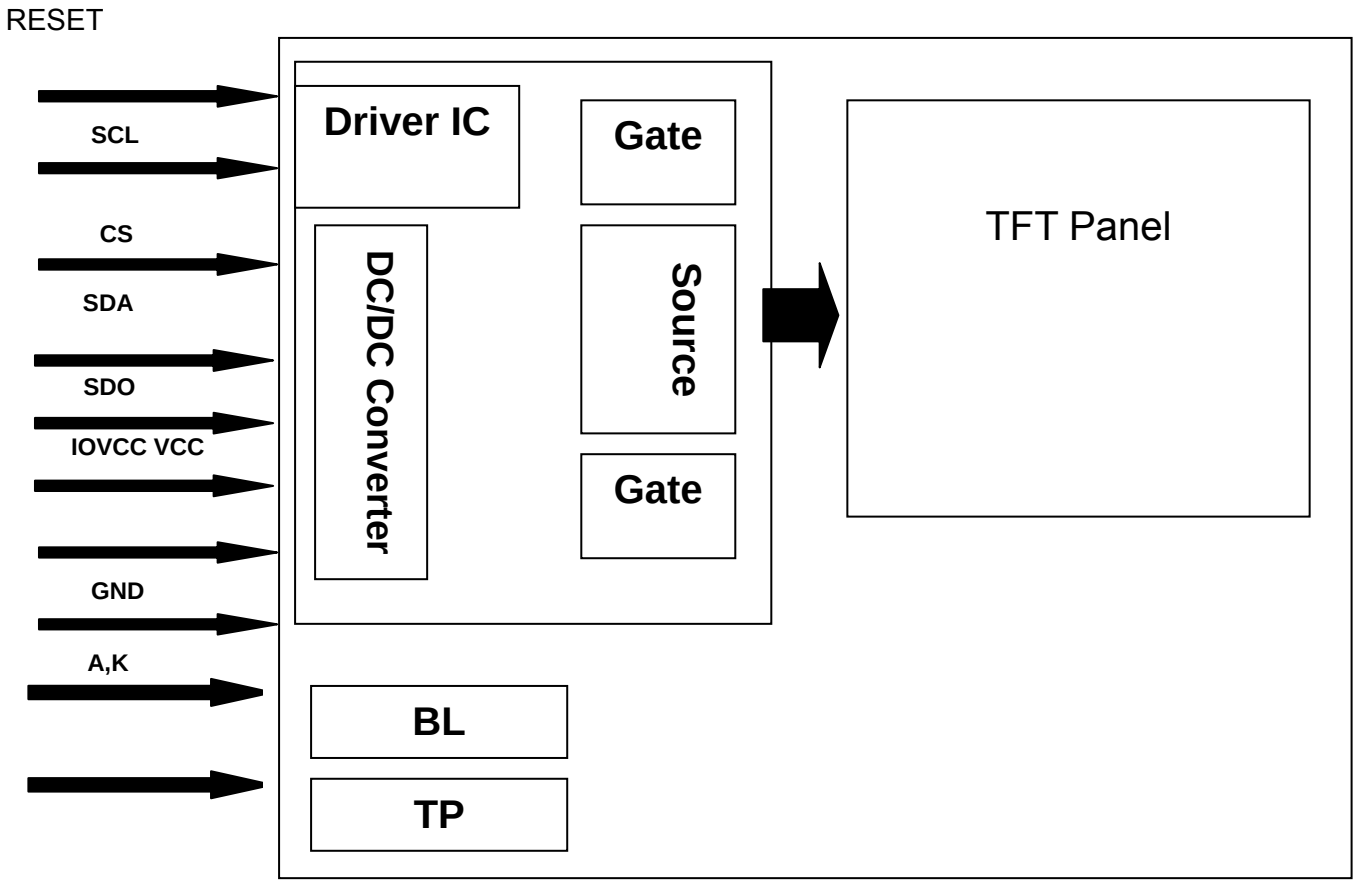
Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	120	140	mA	
Forward Voltage	V_F	-	3.2	-	V	
Connection mode	P	--	6 Parallel	--		
LED number	/		6		pcs	
LED life time		20000			hours	

Note1: 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.



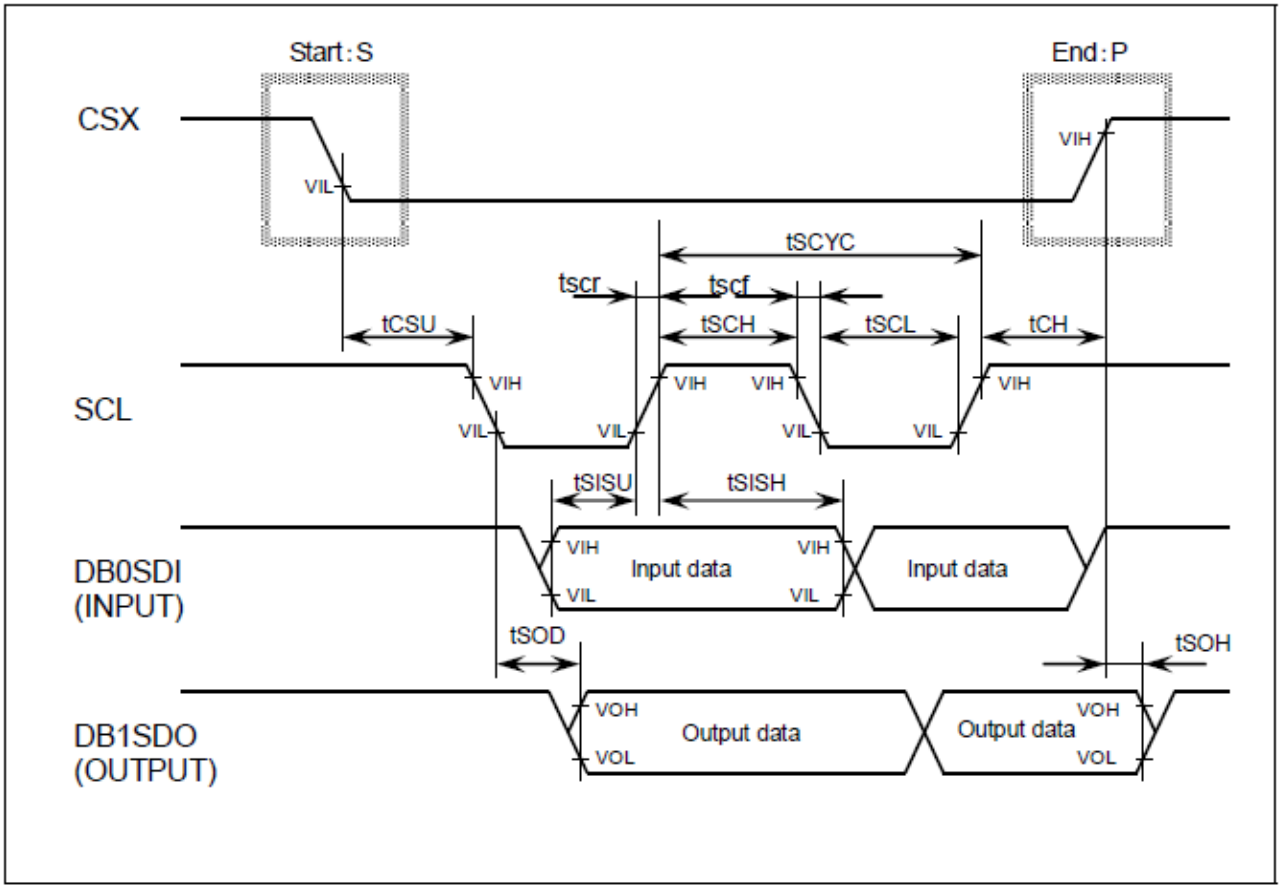
4.3 Block Diagram



5 INTERFACE TIMING

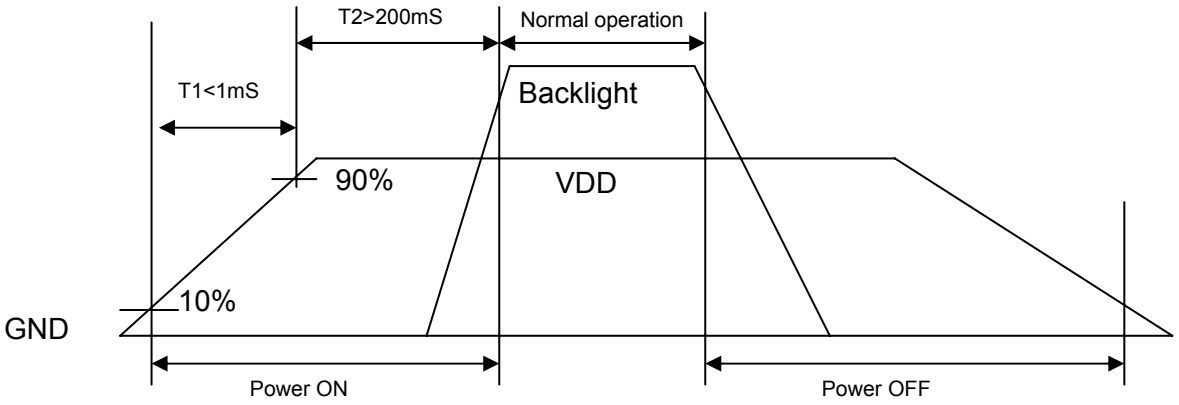
5.1 RGB interface

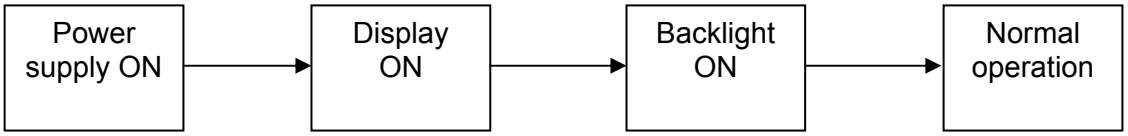
Clock Synchronous Serial Interface



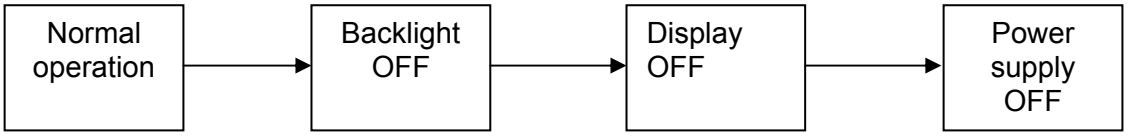
Item	Symbol	Unit	Min.	Typ.	Max.
Serial clock cycle time	t_{SCL}	ns	2500	-	-
Serial clock "High" period	t_{SCLH}	ns	600	-	-
Serial clock "Low" period	t_{SCLL}	ns	1300	-	-
Bus free time	t_{BUF}	ns	300	-	-
Start condition Hold time	t_{STAH}	ns	600	-	-
Restart condition setup time	t_{STAS}	ns	600	-	-
Stop condition setup time	t_{STOPS}	ns	600	-	-
Data setup time	t_{SDAS}	ns	100	-	-
Data hold time	t_{SDAH}	ns	0	-	-

5.2 Power ON/OFF Timing





Power ON sequence



Power OFF sequence

6 Optical Characteristics

Ta=25℃

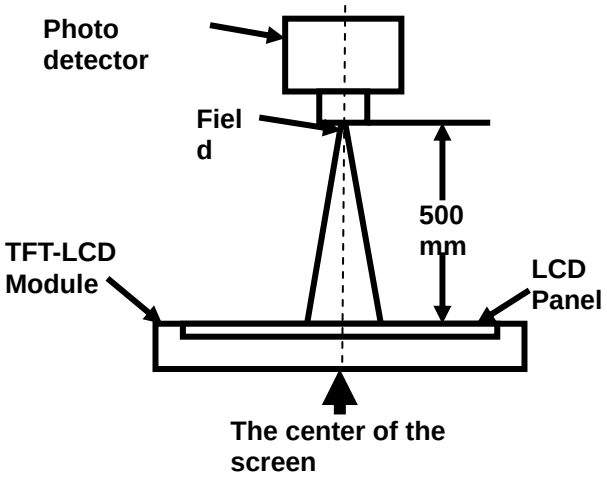
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	CR≧10	70	80	-	Degree	Note 2
	θB		70	80	-		
	θL		70	80	-		
	θR		70	80	-		
Contrast Ratio	CR	θ=0°	500	600	-	-	Note1 Note3
Response Time	T_{ON}	25℃	-	15	-	ms	Note1 Note4
	T_{OFF}						
Uniformity	U	-	70	80	-	%	Note1 Note6
NTSC	-	-	-	50	-	%	Note 5
Luminance	L		280	300	-	cd/m^2	Note1 Note7

Test Conditions:

1. V_F=3.2V, I_F=120mA, the ambient temperature is 25℃.
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.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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)。

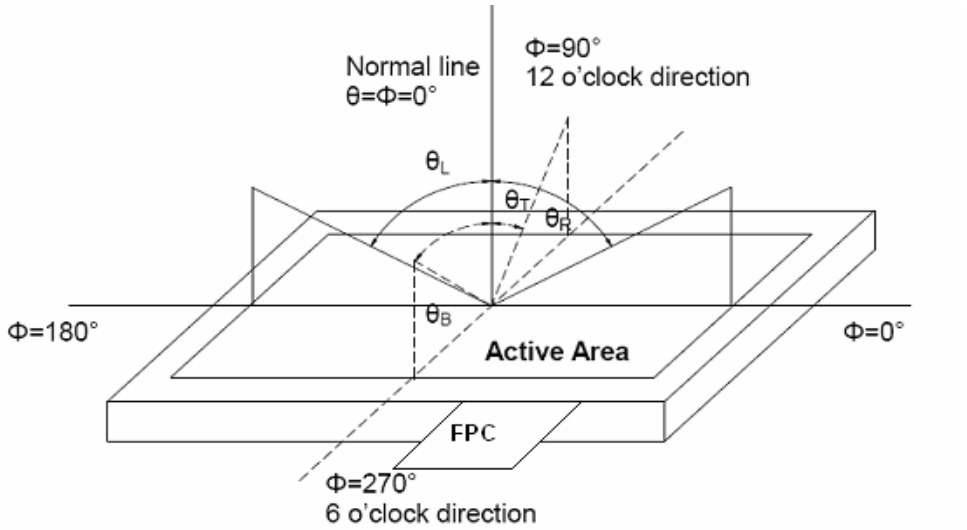


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

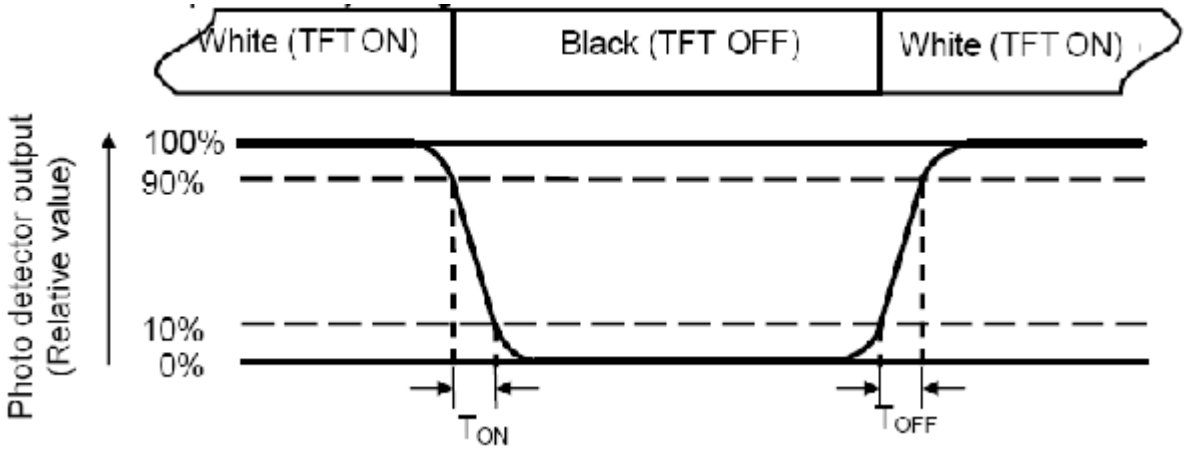
“White state “:The state is that the LCD should be driven by Vwhite.

“Black state”: The state is that the LCD should be driven by Vblack.

Vwhite: To be determined Vblack: 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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) 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.

Luminance Uniformity (U) = Lmin/ Lmax

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

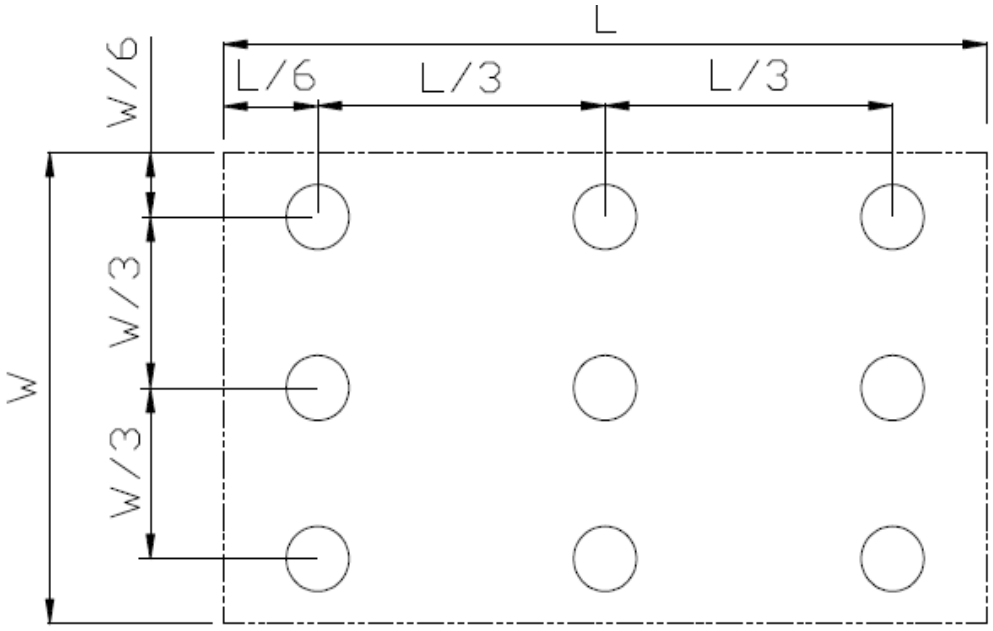


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: 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

Item	Condition	Time (hrs)	Assessment
High temp. Storage	80°C	120	No abnormalities in functions and appearance
High temp. Operating	70°C	120	
Low temp. Storage	-30°C	120	
Low temp. Operating	-20°C	120	
Humidity	40°C/ 90%RH	120	
Thermal Shock(Non-operation)	-20°C ← 25°C →70°C (0.5 hour ← 5 min → 0.5 hour)	10cycles	

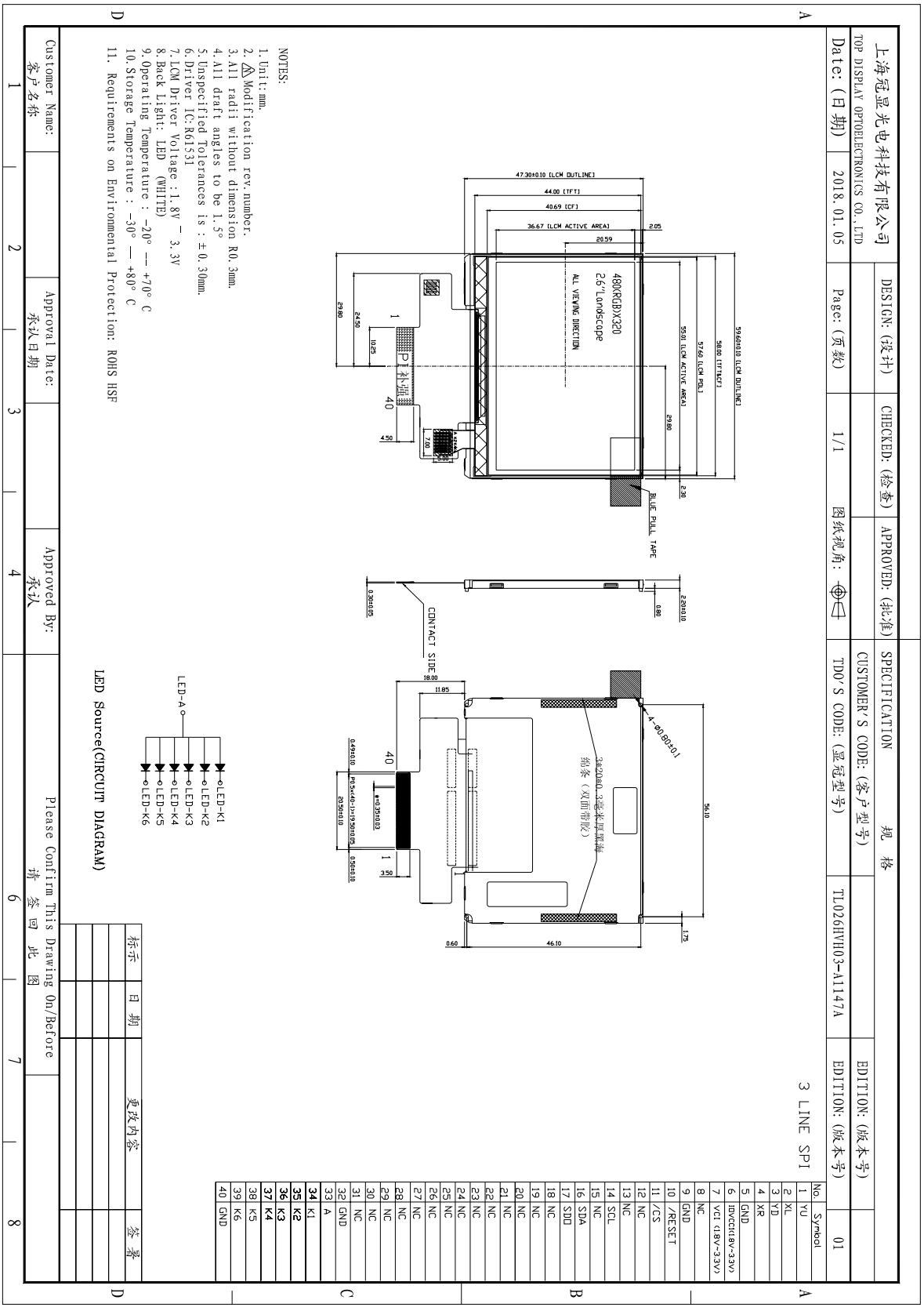
Remark:

1.The test samples should be applied to only one test item.

2.Sample size for each test item is 1~10pcs.

3.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

8 Mechanical Drawing



9 Precautions For Use of LCD Modules

9.1 Handling Precautions

9.1.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.1.2 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.

9.1.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.1.5 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 alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

9.1.1.6 Do not attempt to disassemble the LCD Module.

9.1.1.7 If the logic circuit power is off, do not apply the input signals.

9.1.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

9.1.1.9 Be sure to ground the body when handling the LCD Modules.

9.1.1.10 Tools required for assembly, such as soldering irons, must be properly ground.

9.1.1.11 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

9.1.1.12 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.

9.1.1.13 Storage precautions

9.1.1.14 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.1.1.15 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:

9.1.1.16 Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

9.1.1.17 The LCD modules should be stored in the room without acid, alkali and harmful gas.

9.2 Transportation Precautions

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