MODEL NO. :   **TS035KAAVB02-00**

ISSUED DATE: **2008-01-17**

VERSION   :   **Ver1.2**

■ **Preliminary Specification**
☐ **Final Product Specification**

Customer :

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by
徐昀		

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description
1.0	Dec,05,2007	Preliminary release
1.1	Dec,27,2007	Modify RA conditions
1.2	Jan,17,2008	Modify mechanical drawing

1 GENERAL SPECIFICATIONS

Feature		Spec
Display Spec.	Size	3.5"
	Resolution	320(RGB) X 240
	Interface	RGB/CCIR656/601
	Color Depth	24bit
	Technology type	a-si
	Pixel pitch (mm)	0.219 x 0.219
	Display colors	16.7M dithering
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment	Anti-Glare , 3H
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	76.9 x 63.9 x 4.0
	Active Area(mm)	70.08 x 52.56
	With /Without TSP	WITH TSP
	Weight (gram)	TBD.
	LED Numbers	6 LEDs Serial
	Driver IC	Novatek NT39016D

Note 1: Requirements on Environmental Protection: RoHS

2 INPUT/OUTPUT TERMINALS

2.1 TFT LCD Panel

No	Symbol	I/O	Description	Remark
1,2	LED_Cathode	I	LED_Cathode	Note 2-1
3,4	LED_Anode	I	LED_Anode	Note 2-1
5	NC	-	No Connect	
6	RESET	I	Reset	
7	NC	-	No Connect	
8	YU	I	Y_Up	
9	XR	I	X_Right	
10	YD	I	Y_Bottom	
11	XL	I	X_Left	
12	D00	I	Data 00	Note 2-2
13	D01	I	Data 01	Note 2-2
14	D02	I	Data 02	Note 2-2
15	D03	I	Data 03	Note 2-2
16	D04	I	Data 04	Note 2-2
17	D05	I	Data 05	Note 2-2
18	D06	I	Data 06	Note 2-2
19	D07	I	Data 07	Note 2-2
20	D08	I	Data 08	Note 2-2
21	D09	I	Data 09	Note 2-2
22	D10	I	Data 10	Note 2-2
23	D11	I	Data 11	Note 2-2
24	D12	I	Data 12	Note 2-2
25	D13	I	Data 13	Note 2-2
26	D14	I	Data 14	Note 2-2
27	D15	I	Data 15	Note 2-2
28	D16	I	Data 16	Note 2-2
29	D17	I	Data 17	Note 2-2
30	D18	I	Data 18	Note 2-2
31	D19	I	Data 19	Note 2-2
32	D20	I	Data 20	Note 2-2
33	D21	I	Data 21	Note 2-2
34	D22	I	Data 22	Note 2-2
35	D23	I	Data 23	Note 2-2

36	HSYNC	I	Horizontal Synchronous Signal	
37	VSYNC	I	Vertical Synchronous Signal	
38	CLK	I	Data Clock	
39	NC	-	No Connect	
40	NC	-	No Connect	
41	VDD	P	power supply	
42	VDD	P	power supply	
43	SPENA	I	Serial port data enable signal	
44	NC	-	No Connect	
45	NC	-	No Connect	
46	NC	-	No Connect	
47	NC	-	No Connect	
48	NC	-	No Connect	
49	SPCK	I	SPI Serial Clock	
50	SPDA	I/O	SPI Serial Data Input/output	
51	NC	-	No Connect	
52	DEN	I	Data enabling signal	
53	GND	P	Ground	
54	GND	P	Ground	

I: input   O: output   P: power

Note 2-1: The figure below shows the connection of LED
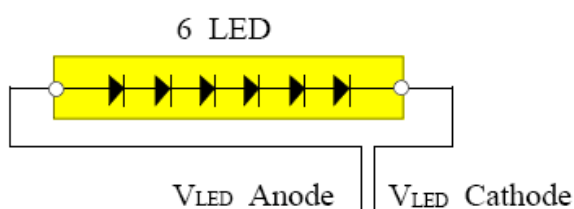
Note 2-2:

Mode	D(23:16)	D(15:8)	D(7:1)	HSYNC	VSYNC	DEN
CCIR 656	D(23:16)	GND	GND	NC	NC	NC
CCIR 601	D(23:16)	GND	GND	HSYNC	VSYNC	NC
8 Bit RGB	D(23:16)	GND	GND	HSYNC	VSYNC	NC for HV mode
						DEN for DEN mode
24 Bit RGB	R(7:0)	G(7:0)	B(7:0)	HSYNC	VSYNC	NC for HV mode
						DEN for DEN mode

3 ABSOLUTE MAXIMUM RATINGS

Ta = 25℃

Item	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VDD	-0.3	5.0	V	
Operating Temperature	T_{OPR}	-20	60	℃	
Storage Temperature	T_{STG}	-30	70	℃	

4   ELECTRICAL CHARACTERISTICS

4.1. Driving TFT LCD Panel

GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply Voltage		VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	V_{IL}	0		0.3VCC	V	
	High Level	V_{IH}	0.7VCC		VCC	V	
(Panel+LSI) Power Consumption	Black Mode(60HZ)			TBD		mW	
	Sleeping Mode			TBD		mW	

4.2   Driving Backlight

Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	20	25	mA	
Forward Current Voltage	V_F	16.8	19.2	21.6	V	
Backlight Power Consumption	W_{BL}	--	384	--	mW	

4.3.   Block Diagram
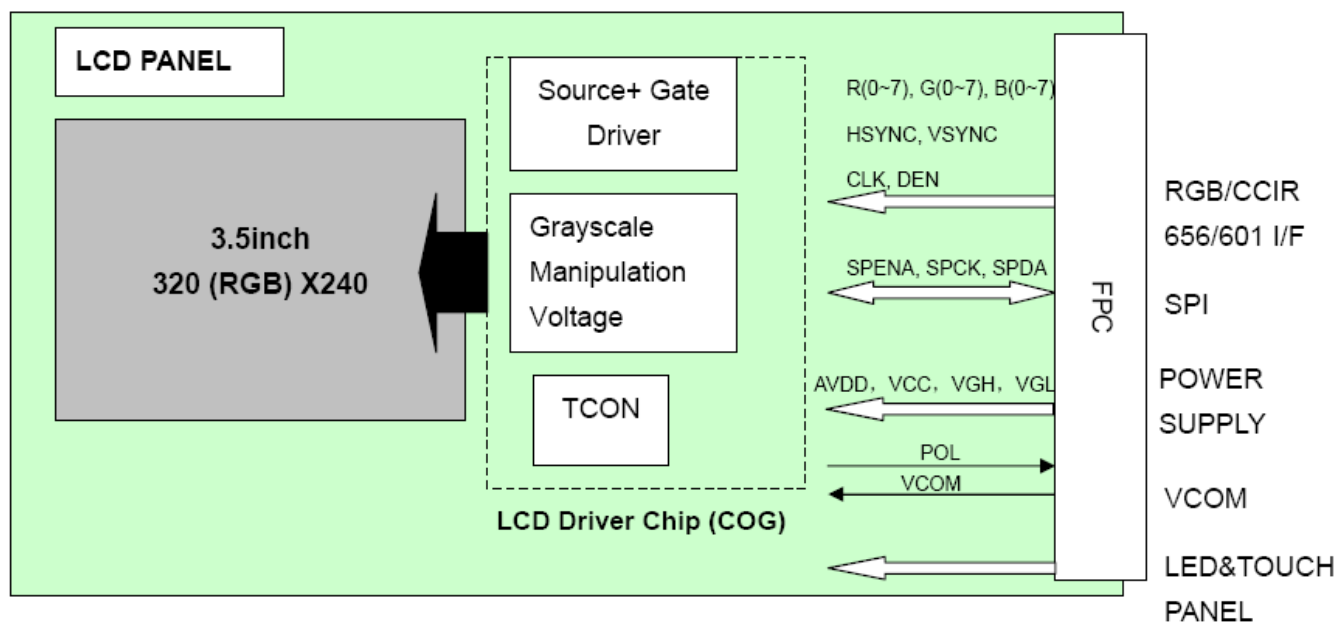
5   TIMING CHART

TBD

6 OPTICAL CHARACTERISTICS

6.1 Optical Specification

Ta=25℃

| Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
View Angles		ΘT	CR$\geqq$10	30	40		Degree	Note 2
		ΘB		50	60			
		ΘL		50	60			
		θR		50	60			
Contrast Ratio		CR	$\theta=0°$		350			Note3
Response Time		Ton	25℃		25		ms	Note4
		Toff						
Chromaticity	**White**	x		0.260	0.310	0.360		Note1，5
		y		0.283	0.333	0.383		
	RED	x		0.574	0.624	0.674		
		y		0.318	0.368	0.418		
	GREEN	x		0.300	0.350	0.400		
		y		0.500	0.550	0.600		
	BLUE	x		0.093	0.143	0.193		
		y		0.069	0.119	0.169		
Uniformity		U		75	80		%	Note6
NTSC					50%		%	Note 5
Luminance(w TSP)		L		280	350		cd/m^2	Note7

Test Conditions:

1. VDD=3.3V, I_L =20mA(Backlight current), 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.
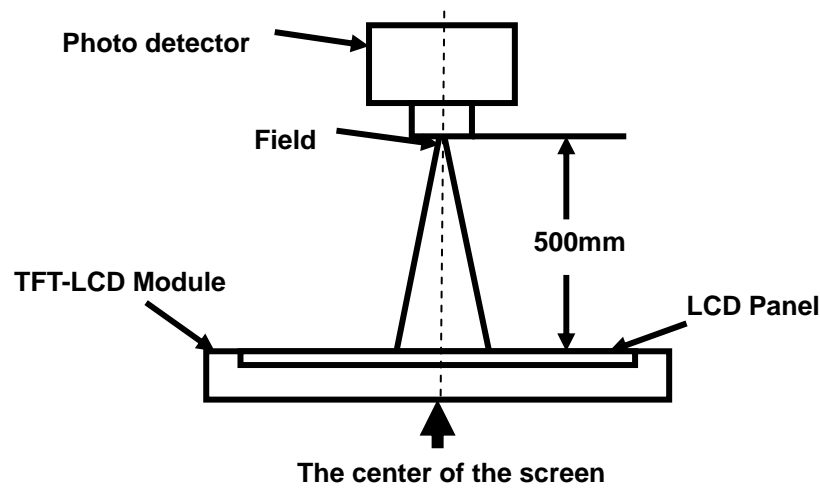
Item	Photo detector	Field
Contrast Ratio		
Luminance	SR-3	1°
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	

Note 2: Definition of viewing angle range and measurement system.
viewing angle is measured at the center point of the LCD by LCD5200。
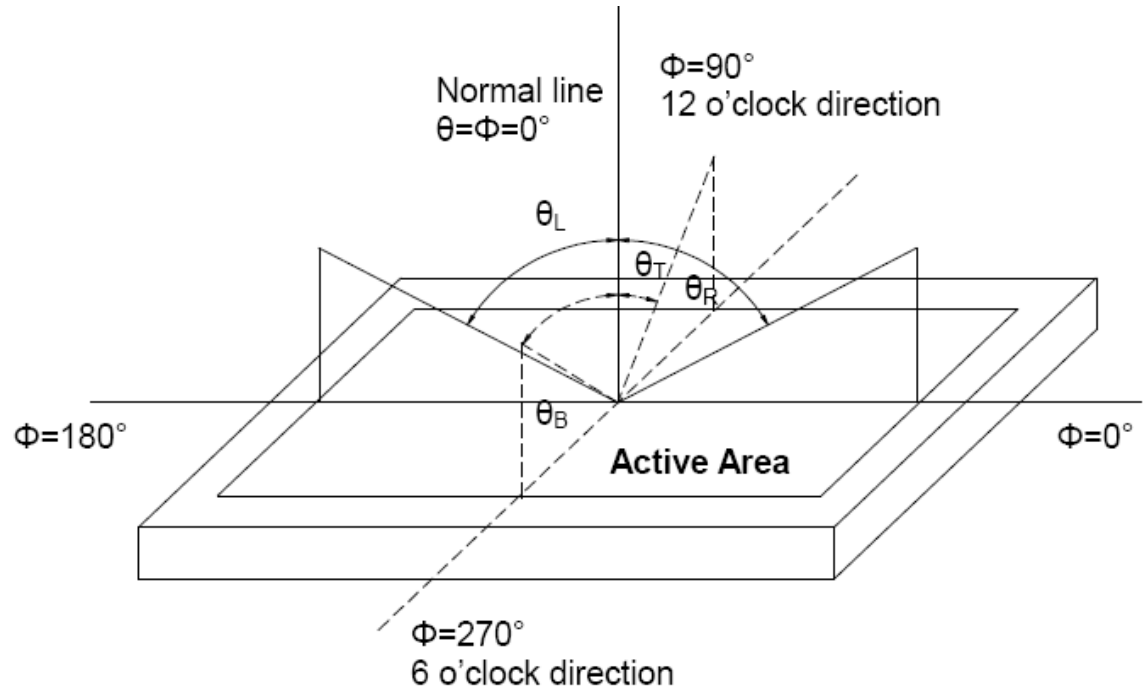
Fig. 1 Definition of viewing angle

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 which the LCD is driven by V_{white}.

"Black state": The state is which the LCD is 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 (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%.
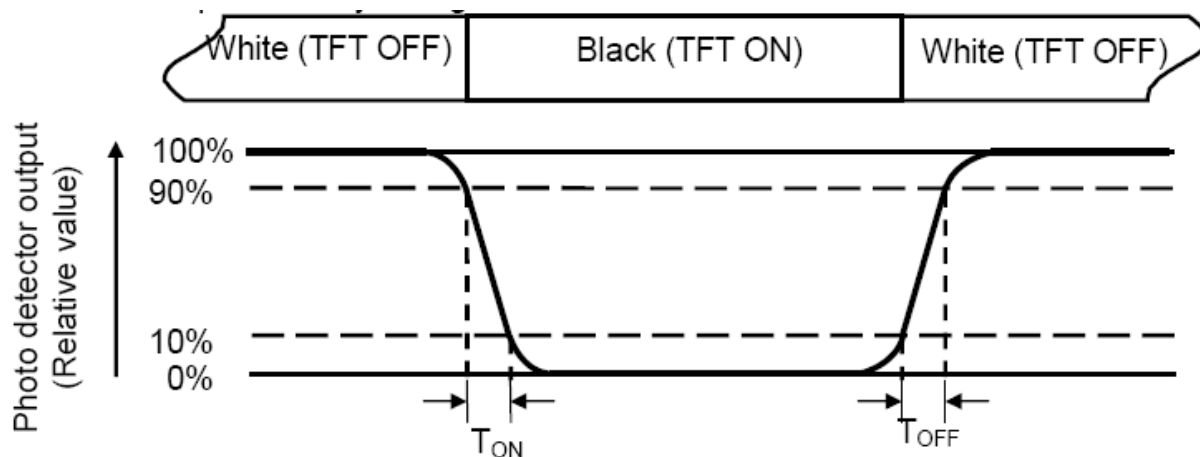
Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

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) $= L_{min}/L_{max}$
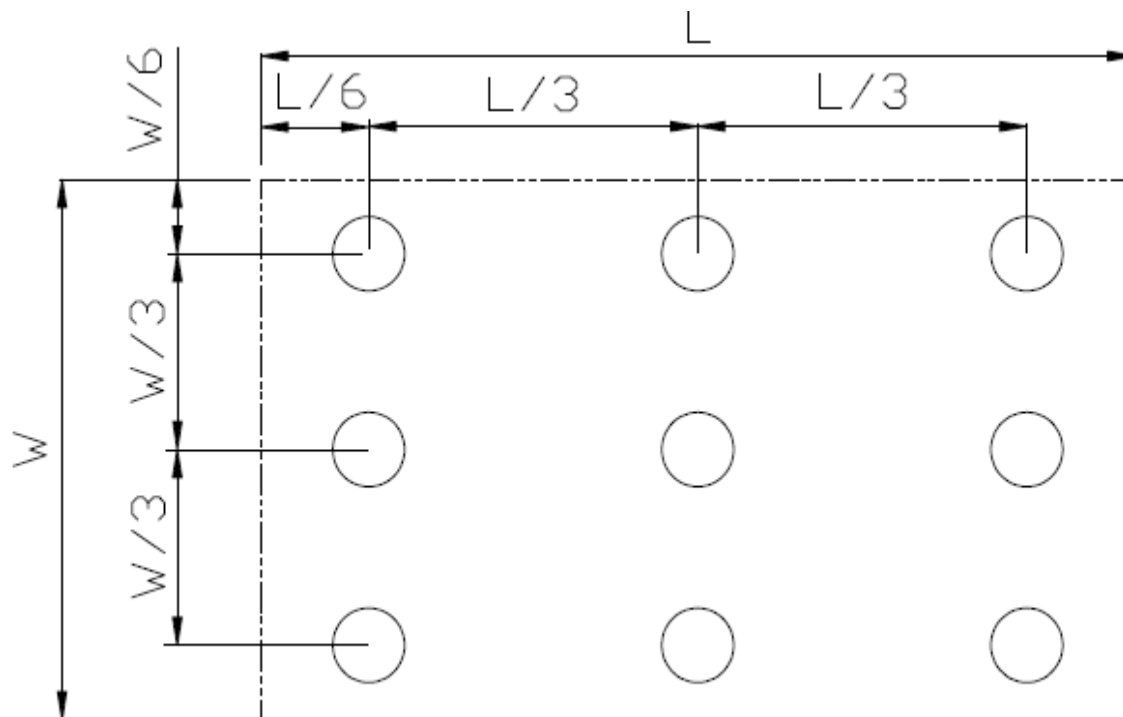
L-------Active area length W----- Active area width

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

5 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+60℃, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	Low Temperature Operation	Ta=-20℃, 240hrs	Note 2, IEC60068-2-1 GB2423.1—89
3	High Temperature Storage (non-operation)	Ta=+70℃, 240hrs	IEC60068-2-2, GB2423.2—89
4	Low Temperature Storage (non-operation)	Ta=-30℃, 240hrs	IEC60068-2-1 GB2423.1—89
5	High Temperature & High Humidity（Non-Operation）	+60℃, 90% RH max,240 hours	IEC60068-2-3, GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14,GB2423.22—87
7	Electro Static Discharge (operation)	C=150pF, R=330Ω，5points/panel Air:±8KV，5times;Contact:±4KV，5 times;（Environment: 15℃～35℃，30%～60%，86Kpa～106Kpa）	IEC61000-4-2 GB/T17626.2—1998
8	Vibration (non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.(package condition)	IEC60068-2-6 GB/T2423.10—1995
9	Shock (non-operation)	60G 6ms, ±X,±Y,±Z 3times for each direction (package condition)	IEC60068-2-27 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm，1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8—1995

8   MECHANICAL DRAWING
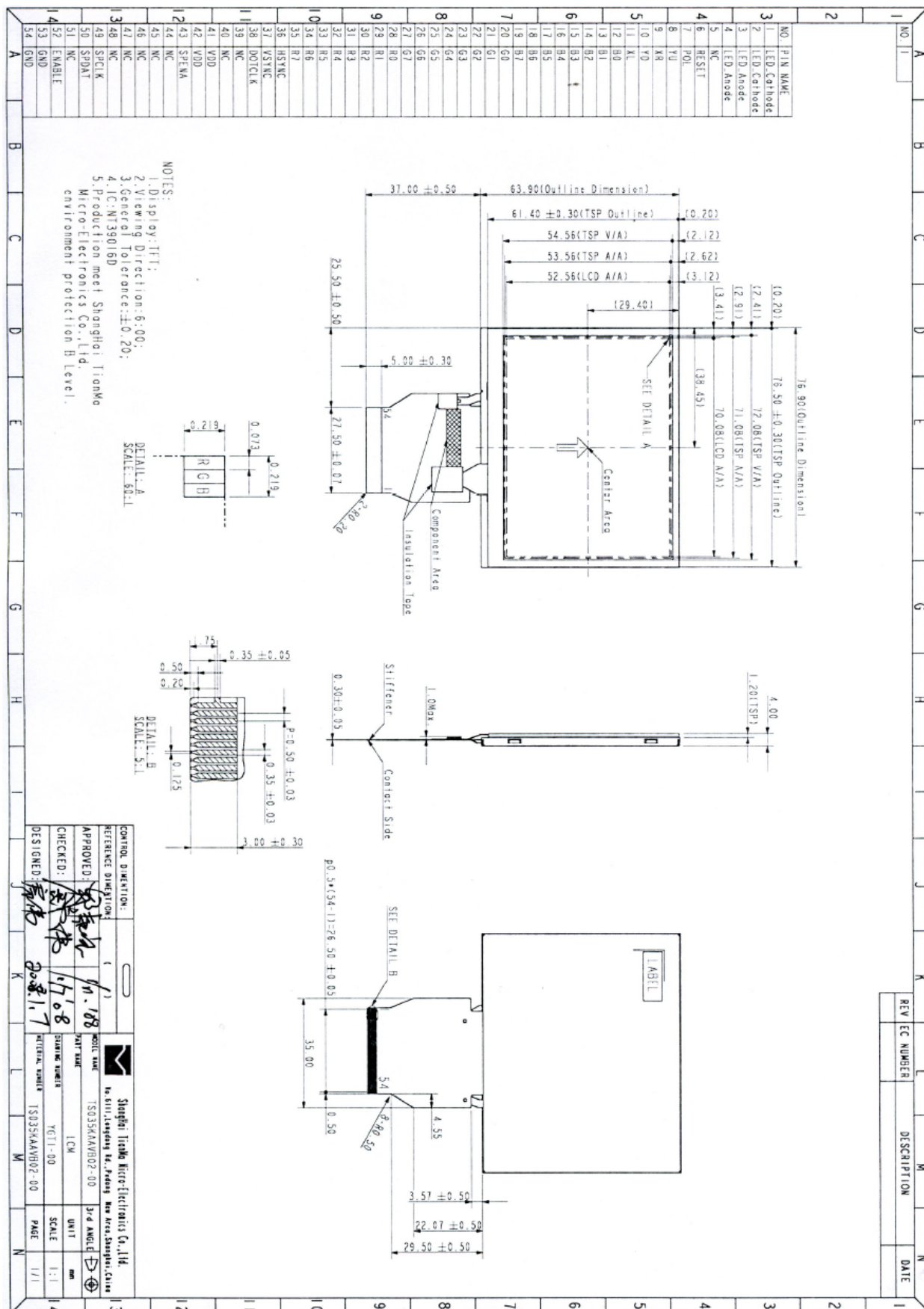
9   Packing Drawing

TBD

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 alcohol

Solvents 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.

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

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

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

d. 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.