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Custom Display

Mechanical design



Shenzhen Aoshite Technology Co.,LTD

MODEL NO : ET013QCI-OL

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2023-06-07

☒ **Preliminary Specification**

☐ **Final Product Specification**

Customer : _____

Approved by	Notes

Youri Confirmation

Prepared by	Reviewed by	Approved by
John	Johnny	Wang

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1 General Specifications

Feature		Spec
Display Spec.	Size	1.28inch
	Resolution	176 X 176
	Technology Type	TFT-LCD
	Pixel Configuration	Rendering
	Pixel pitch(mm)	0.1308*0.1308
	Viewing Direction	ALL
Mechanical Characteristics	MODEL (W x H x D) (mm)	36.20 *37.80*3.63
	LCD Active Area(mm)	23.0208 * 23.0208
	With /Without TSP	NO
	Weight (g)	TBD
Electrical Characteristics	LCD Interface	SPI
	Color Depth	2 COLOR

Note 1:This TFT-LCD module is reflective active-matrix with slightly transmissive memory liquid crystal display module with CG silicone thin film transistor.

2 Terminals

2.1 TFT FPC

Pin No.	Symbol	Description
1	SCLK	Serial clock signal
2	SI	Serial data input signal
3	SCS	Chip select signal(Active of Hi)
4	EXTCOMIN	External COM inversion signal input (Square wave)
5	DISP	Display ON/OFF signal
6	VDDA	Power supply(analog)
7	VDD	Power supply(digital)
8	EXTMODE	Control mode of COM inversion is select terminal
9	VSS	Ground(digital)
10	VSSA	Ground(analog)

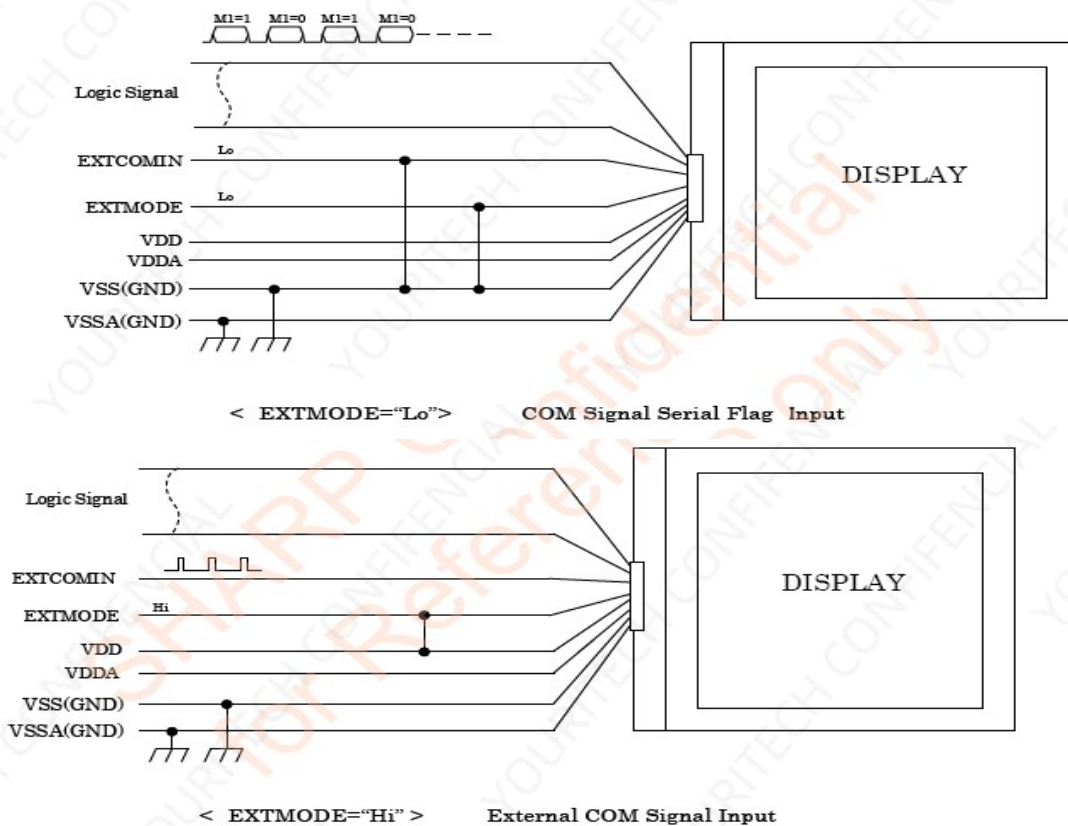


Figure 4-2-1 Recommended circuit

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2.2 BACKLIGHT FPC

Pin No.	Symbol	Description
1	Cathode2	Power Supply for LED backlight
2	Cathode1	Power Supply for LED backlight
3	Anode	Power Supply for LED backlight
4	Anode	Power Supply for LED backlight

3 Absolute Maximum Ratings

Characteristics	Symbol	Min.	Max.	Unit	Notes
Analog power voltage	VDDA	-0.3	3.6	V	-
Digital I/O voltage	VDD	-0.3	3.6	V	-
Input signal voltage(Hi)	VHI	-	VDD	V	
Input signal voltage(Low)	VLI	-0.3	-	V	-
Operating temperature	TOP	-20	70	°C	
Storage temperature	Tstg	-30	80	°C	

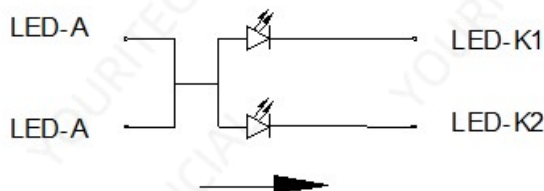
4 Electrical Characteristics

4.1 DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Notes
Analog power voltage	VDD	2.7	3.0	3.3	V	-
Digital I/O voltage	VDDA	2.7	3.0	3.3	V	-
Input signal voltage(Hi)	VHI	VDD-0.1	VDD	VDD	V	-
Input signal voltage(Low)	VLI	VSS	VSS	VSS+0.1	V	
Backlight forward current	VF	10	30	40	mA	

Note:VDD>=VDDA

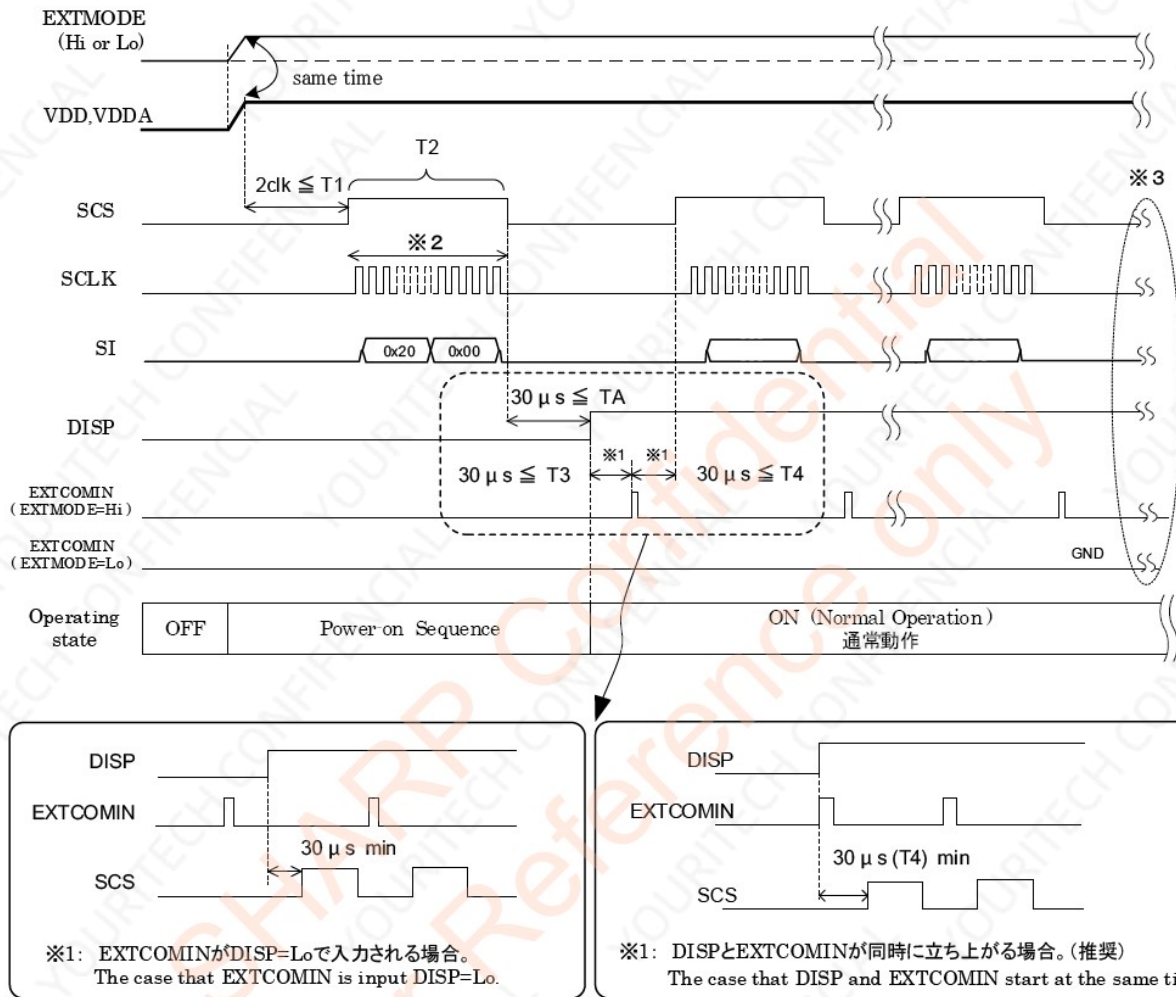
CIRCUIT DIAGRAM
(LED 2x1=2 SMD)



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5 Timing Chart

5.1 power supply sequence.



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※1 TAとT3は逆でも可(但し、DISP="Lo"の間にEXTCOMINを入れてもTCOMの極性反転は起きません。)

また、DISPとEXTCOMINを同時に立ち上げた場合、SCSの立ち上げまで30us以上の時間を空けて下さい。

(60usでなくても可)

TA and T3 may be opposite

(however, TCOM polarity inversion will not occur even with EXTCOMIN between DISP="Lo".)

Also, when DISP and EXTCOMIN are simultaneously started up, allow 30us or

more before SCS starts up (It may be less than 60us).

※2 画素メモリ内を初期化する際の設定値

SCS=画素内メモリをクリアにする方法に応じた駆動をする事(全クリアフラグ使用 or 画面全体に白書き込み)

SI=M2(全クリアフラグ)="Hi" 又は 白書き込み

SCLK:通常動作

Setting value for pixel memory initialization

SCS=Driving accordingly to clear pixel internal memory method(use all clear flag or write all screen white)

S1=M2 (all clear flag) = "Hi" or write white

SCLK: Normal Driving

※3:・SCSK,SCS,SI端子はデータ送信を行わない時は、必ず"Lo"に設定してください。

DISP端子は電源ON状態時は"Hi"を保持してください。

EXTCOMIN端子は

EXTMODE=Lo設定の場合は必ず"Lo"設定にしてください。

EXTMODE=Hi設定の場合は、一定の周期の信号を入力してください。

EXTMODE端子は、Hi/Loどちらかに固定してください。

Make SCLK,SI and SCS terminals "Lo" while it does not communicate.

Keep "Hi" DISP terminal, when power supply on (VDD).

EXTCOMIN terminal

This is valid the case of EXTMODE="Lo" as EXTCOMIN="Lo".

This is valid the case of EXTMODE="Hi" a periodic signal input is necessary.

Not change (Hi to Lo or Lo to Hi) after starting power supply and during ON

T1:電源が安定してから、Signal送信を開始してください。

Please start the Signal transmission after a power supply was stable.

TA:イニシャライズ完了後にDISPをHiにしてください。

Please set DISP to Hight Level after the completion of initialization.

※詳細は、タイミングチャート、ACタイミング特性参照

Refer to timing chart and AC timing characteristics for detail

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5.2 Input Signal timing Parameters

VDDA=+3.0V, VDD=+3.0V, GND=0V, Ta=25°C

	Item	Symbol	Min	Typ	Max	Unit	Remark
SCS	Rise time	trSCS	-	-	50	ns	
	Fall Time	tfSCS	-	-	50	ns	
	High duration	twhSCS	198	-	-	us	Data update mode [Note 6-3-6]
			22.54	-	-	us	Hold mode [Note 6-3-6]
	Low duration	twlSCS	6	-	-	us	
	Set up time	tsSCS	6	-	-	us	
	Hold time	thSCS	2	-	-	us	
SI	Rise time	trSI	-	-	50	ns	
	Fall time	tfSI	-	-	50	ns	
	Set up time	tsSI	250	-	-	ns	
	Hold time	thSI	350	-	-	ns	
SCLK	Clock frequency	fSCLK	-	1	1.1	MHz	
	Rise time	trSCLK	-	-	50	ns	
	Fall time	tfSCLK	-	-	50	ns	
	High duration	twhSCLK	454.55	500	-	ns	
	Low duration	twlSCLK	454.55	500	-	ns	
EXTCOMIN	Frequency	fEXTCOMIN	57	60	90	Hz	[Note 6-3-5]
	Rise time	trEXTCOMIN	-	-	50	ns	
	Fall time	tfEXTCOMIN	-	-	50	ns	
	High duration	twhEXTCOMIN	2	-	-	us	
DISP	Rise time	trDISP	-	-	50	ns	
	Fall time	tfDISP	-	-	50	ns	

【Note 6-3-6】 表示データを書き込んだ後は、SCSをLの状態にしてください。

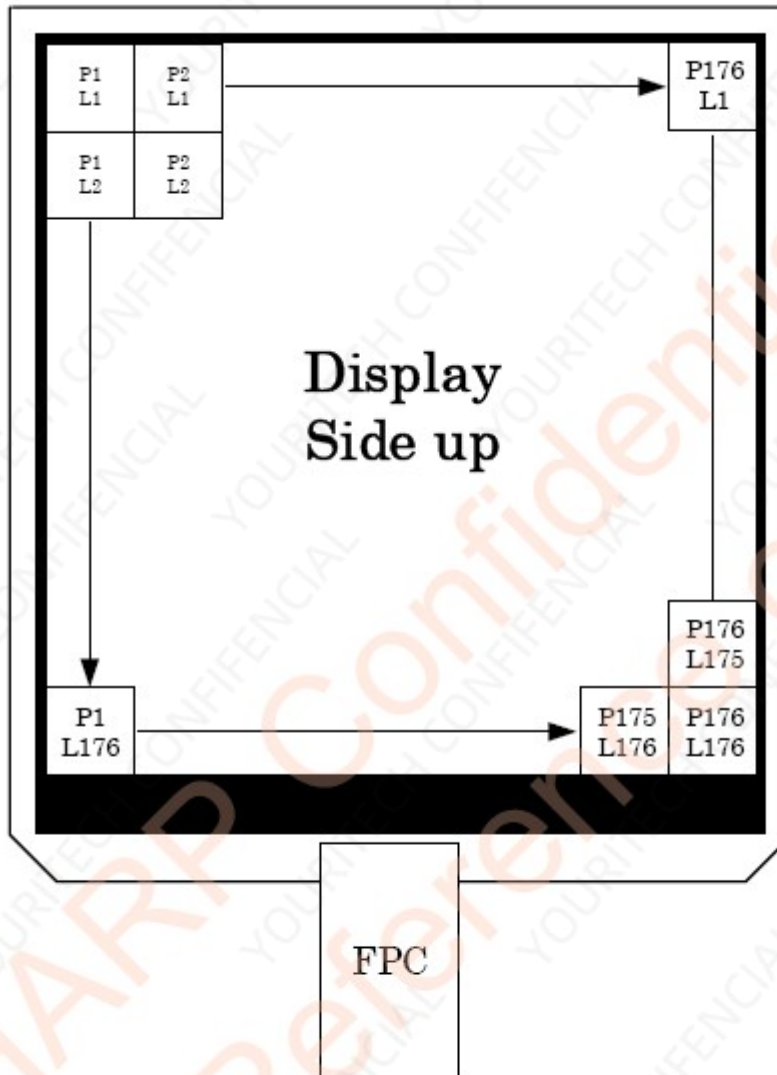
Please keep SCS in the state of L when you maintain current display after writing of the display data.

5.3 Gate line address setting

GL	AG0	AG1	AG2	AG3	AG4	AG5	AG6	AG7	GL	AG0	AG1	AG2	AG3	AG4	AG5	AG6	AG7	GL	AG0	AG1	AG2	AG3	AG4	AG5	AG6	AG7
1	1	0	0	0	0	0	0	0	61	1	0	1	1	1	1	0	0	121	1	0	0	1	1	1	1	0
2	0	1	0	0	0	0	0	0	62	0	1	1	1	1	1	0	0	122	0	1	0	1	1	1	1	0
3	1	1	0	0	0	0	0	0	63	1	1	1	1	1	1	0	0	123	1	1	0	1	1	1	1	0
4	0	0	1	0	0	0	0	0	64	0	0	0	0	0	0	1	0	124	0	0	1	1	1	1	1	0
5	1	0	1	0	0	0	0	0	65	1	0	0	0	0	0	1	0	125	1	0	1	1	1	1	1	0
6	0	1	1	0	0	0	0	0	66	0	1	0	0	0	0	1	0	126	0	1	1	1	1	1	1	0
7	1	1	1	0	0	0	0	0	67	1	1	0	0	0	0	1	0	127	1	1	1	1	1	1	1	0
8	0	0	0	1	0	0	0	0	68	0	0	1	0	0	0	1	0	128	0	0	0	0	0	0	0	1
9	1	0	0	1	0	0	0	0	69	1	0	1	0	0	0	1	0	129	1	0	0	0	0	0	0	1
10	0	1	0	1	0	0	0	0	70	0	1	1	0	0	0	1	0	130	0	1	0	0	0	0	0	1
11	1	1	0	1	0	0	0	0	71	1	1	1	0	0	0	1	0	131	1	1	0	0	0	0	0	1
12	0	0	1	1	0	0	0	0	72	0	0	0	1	0	0	1	0	132	0	0	1	0	0	0	0	1
13	1	0	1	1	0	0	0	0	73	1	0	0	1	0	0	1	0	133	1	0	1	0	0	0	0	1
14	0	1	1	1	0	0	0	0	74	0	1	0	1	0	0	1	0	134	0	1	1	0	0	0	0	1
15	1	1	1	1	0	0	0	0	75	1	1	0	1	0	0	1	0	135	1	1	1	0	0	0	0	1
16	0	0	0	0	1	0	0	0	76	0	0	1	1	0	0	1	0	136	0	0	0	1	0	0	0	1
17	1	0	0	0	1	0	0	0	77	1	0	1	1	0	0	1	0	137	1	0	0	1	0	0	0	1
18	0	1	0	0	1	0	0	0	78	0	1	1	1	0	0	1	0	138	0	1	0	1	0	0	0	1
19	1	1	0	0	1	0	0	0	79	1	1	1	1	0	0	1	0	139	1	1	0	1	0	0	0	1
20	0	0	1	0	1	0	0	0	80	0	0	0	0	1	0	1	0	140	0	0	1	1	0	0	0	1
21	1	0	1	0	1	0	0	0	81	1	0	0	0	1	0	1	0	141	1	0	1	1	0	0	0	1
22	0	1	1	0	1	0	0	0	82	0	1	0	0	1	0	1	0	142	0	1	1	1	0	0	0	1
23	1	1	1	0	1	0	0	0	83	1	1	0	0	1	0	1	0	143	1	1	1	1	0	0	0	1
24	0	0	0	1	1	0	0	0	84	0	0	1	0	1	0	1	0	144	0	0	0	0	1	0	0	1
25	1	0	0	1	1	0	0	0	85	1	0	1	0	1	0	1	0	145	1	0	0	0	1	0	0	1
26	0	1	0	1	1	0	0	0	86	0	1	1	0	1	0	1	0	146	0	1	0	0	1	0	0	1
27	1	1	0	1	1	0	0	0	87	1	1	1	0	1	0	1	0	147	1	1	0	0	1	0	0	1
28	0	0	1	1	1	0	0	0	88	0	0	0	1	1	0	1	0	148	0	0	1	0	1	0	0	1
29	1	0	1	1	1	0	0	0	89	1	0	0	1	1	0	1	0	149	1	0	1	0	1	0	0	1
30	0	1	1	1	1	0	0	0	90	0	1	0	1	1	0	1	0	150	0	1	1	0	1	0	0	1
31	1	1	1	1	1	0	0	0	91	1	1	0	1	1	0	1	0	151	1	1	1	0	1	0	0	1
32	0	0	0	0	0	1	0	0	92	0	0	1	1	1	0	1	0	152	0	0	0	1	1	0	0	1
33	1	0	0	0	0	1	0	0	93	1	0	1	1	1	0	1	0	153	1	0	0	1	1	0	0	1
34	0	1	0	0	0	1	0	0	94	0	1	1	1	1	0	1	0	154	0	1	0	1	1	0	0	1
35	1	1	0	0	0	1	0	0	95	1	1	1	1	1	0	1	0	155	1	1	0	1	1	0	0	1
36	0	0	1	0	0	1	0	0	96	0	0	0	0	0	1	1	0	156	0	0	1	1	1	0	0	1
37	1	0	1	0	0	1	0	0	97	1	0	0	0	0	1	1	0	157	1	0	1	1	1	0	0	1
38	0	1	1	0	0	1	0	0	98	0	1	0	0	0	1	1	0	158	0	1	1	1	1	0	0	1
39	1	1	1	0	0	1	0	0	99	1	1	0	0	0	1	1	0	159	1	1	1	1	1	0	0	1
40	0	0	0	1	0	1	0	0	100	0	0	1	0	0	1	1	0	160	0	0	0	0	0	1	0	1
41	1	0	0	1	0	1	0	0	101	1	0	1	0	0	1	1	0	161	1	0	0	0	0	1	0	1
42	0	1	0	1	0	1	0	0	102	0	1	1	0	0	1	1	0	162	0	1	0	0	0	1	0	1
43	1	1	0	1	0	1	0	0	103	1	1	1	0	0	1	1	0	163	1	1	0	0	0	1	0	1
44	0	0	1	1	0	1	0	0	104	0	0	0	1	0	1	1	0	164	0	0	1	0	0	1	0	1
45	1	0	1	1	0	1	0	0	105	1	0	0	1	0	1	1	0	165	1	0	1	0	0	1	0	1
46	0	1	1	1	0	1	0	0	106	0	1	0	1	0	1	1	0	166	0	1	1	0	0	1	0	1
47	1	1	1	1	0	1	0	0	107	1	1	0	1	0	1	1	0	167	1	1	1	0	0	1	0	1
48	0	0	0	0	1	1	0	0	108	0	0	1	1	0	1	1	0	168	0	0	0	1	0	1	0	1
49	1	0	0	0	1	1	0	0	109	1	0	1	1	0	1	1	0	169	1	0	0	1	0	1	0	1
50	0	1	0	0	1	1	0	0	110	0	1	1	1	0	1	1	0	170	0	1	0	1	0	1	0	1
51	1	1	0	0	1	1	0	0	111	1	1	1	1	0	1	1	0	171	1	1	0	1	0	1	0	1
52	0	0	1	0	1	1	0	0	112	0	0	0	0	1	1	1	0	172	0	0	1	1	0	1	0	1
53	1	0	1	0	1	1	0	0	113	1	0	0	0	1	1	1	0	173	1	0	1	1	0	1	0	1
54	0	1	1	0	1	1	0	0	114	0	1	0	0	1	1	1	0	174	0	1	1	1	0	1	0	1
55	1	1	1	0	1	1	0	0	115	1	1	0	0	1	1	1	0	175	1	1	1	1	0	1	0	1
56	0	0	0	1	1	1	0	0	116	0	0	1	0	1	1	1	0	176	0	0	0	0	1	1	0	1
57	1	0	0	1	1	1	0	0	117	1	0	1	0	1	1	1	0									
58	0	1	0	1	1	1	0	0	118	0	1	1	0	1	1	1	0									
59	1	1	0	1	1	1	0	0	119	1	1	1	0	1	1	1	0									
60	0	0	1	1	1	1	0	0	120	0	0	0	1	1	1	1	0									

GL: Gate address line

5.4 Data position in display[H,V]



P*: Pixels position

L*:Gate address line

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6 Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	40	80	-	Degree	Note2,3
		θB		40	80	-		
		θL		40	80	-		
		θR		40	80	-		
Contrast Ratio		CR	θ=0°	13	18	-		Note 3
Response Time		T _{ON}	25℃	-	30	60	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Normal to surface	0.25	0.30	0.35		Note 1,5
		y		0.23	0.28	0.33		
	Red	x						Note 1,5
		y						
	Green	x						Note 1,5
		y						
	Blue	x						Note 1,5
		y						
Reflectivity ratio		-	R	13	16.6	--	%	-
Luminance		L	IF=40mA	-	30	-	cd/m ²	Note 6

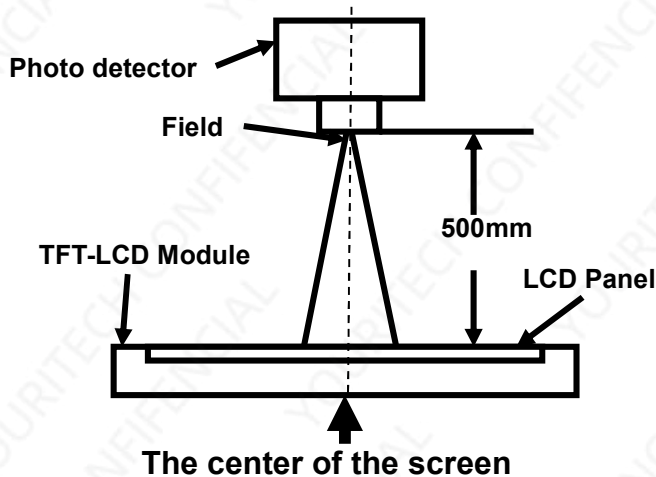
Test Conditions:

1. The ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

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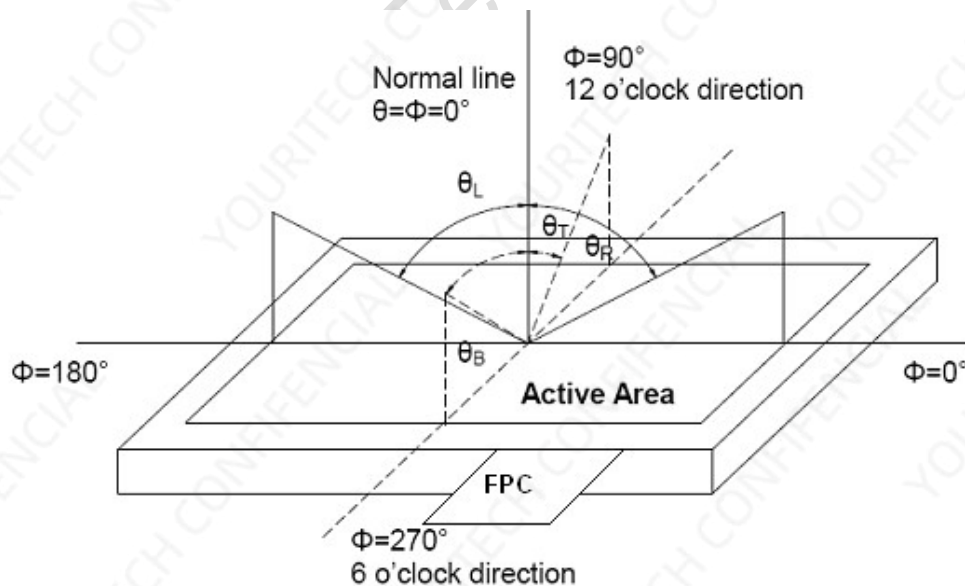
Note 1: Definition of optical measurement system.

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.



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 drive by V_{white} .

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

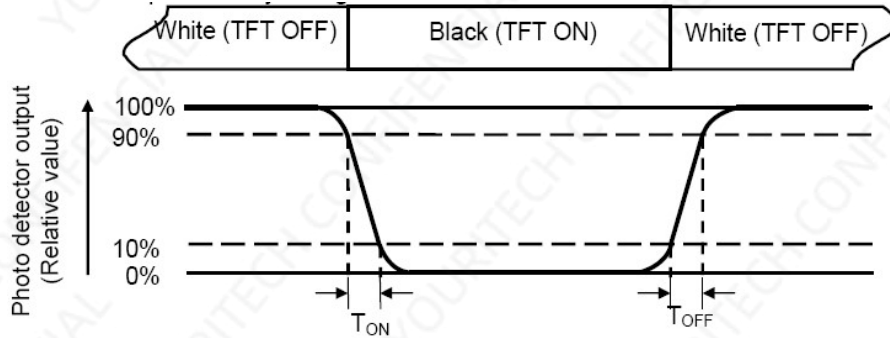
V_{white} : To be determined V_{black} : To be determined.

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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:

Measure the luminance of white state at center point.

7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	70℃, 240Hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃, 240Hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	80℃, 240Hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃, 240Hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	40℃, 90%RH, 240Hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃(1h) ↔ 80℃(1h), 5CYC	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002

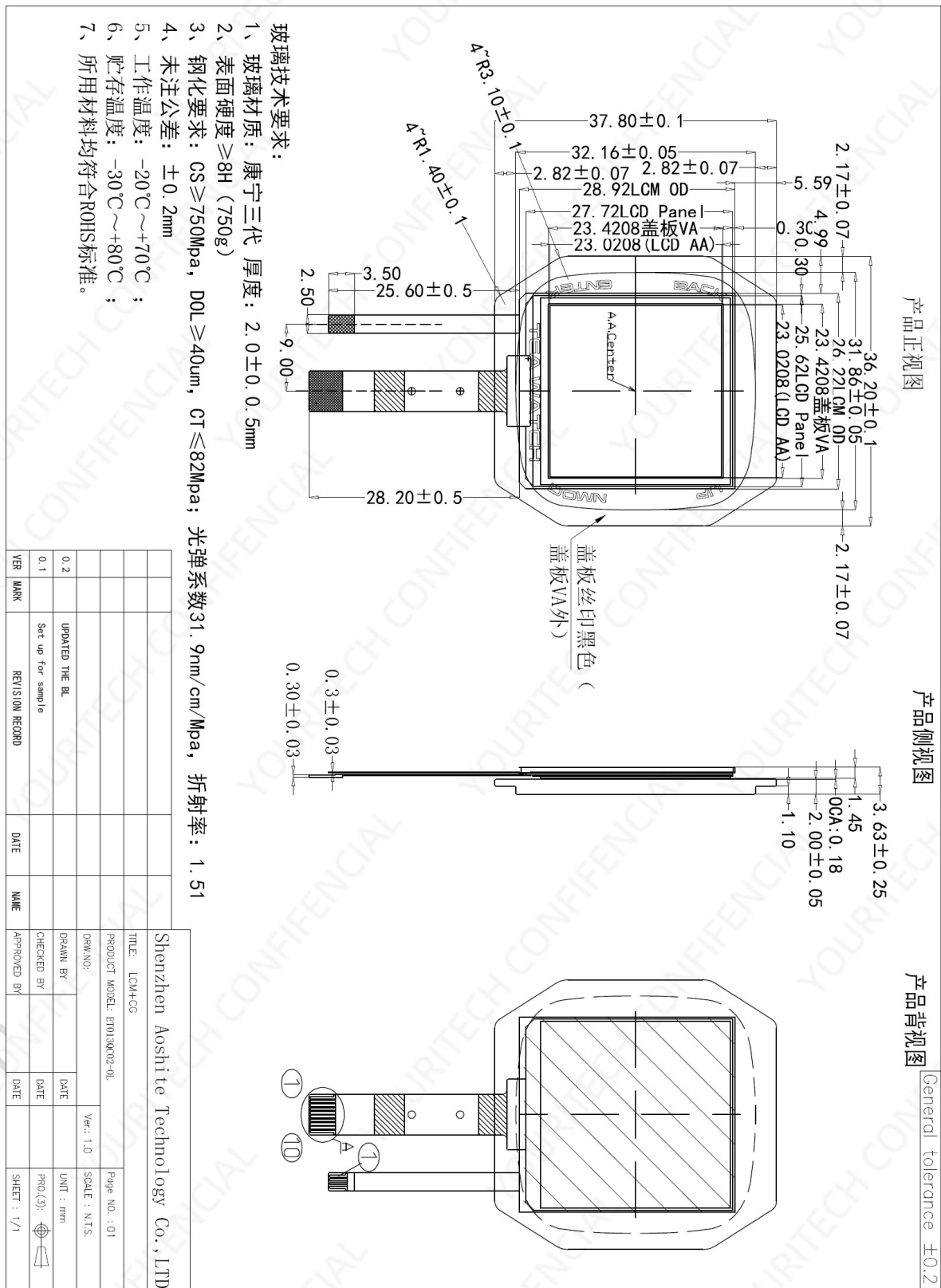
Note1: Ts is the temperature of panel' s surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don' t guarantee all of the cosmetic specification.

8 Outline Dimension



9 Precautions for Use of LCD Modules

a) Handling Precautions

- i. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- ii. 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.
- iii. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- iv. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- v. 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
- vi. Do not attempt to disassemble the LCD Module.
 - vii. If the logic circuit power is off, do not apply the input signals.
 - viii. 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.

b) Storage precautions

- i. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- ii. 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%

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

c) Transportation Precautions

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