MODEL NO. : TS022GAACB04

ISSUED DATE: 2007-10-25

VERSION : Ver 0.10

■ **Preliminary Specification**

□ **Final Product Specification**

Customer :_____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

prepared by	Checked by	Approved by
吴逢治 2007-10-25		刘庆全 2007-10-25

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description
0.10	2007-10-25	Preliminary release

GENERAL SPECIFICATIONS

Feature			Spec
Display Spec.	Size		2.2”
	Resolution		176(RGB) X 220
	Interface		CPU 16/8 bit
	Color Depth		18bit
	Technology type		a-si TFT
	Pixel pitch (mm)		0.198x0.198
	Display colors		262k/65k
	Pixel Configuration		R.G.B. Vertical Stripe
	Display Mode		TM with Normally White
	Surface Treatment (Up Plz)		AG
	Surface Treatment (Touch panel)		Clear type (3H)
	Viewing Direction		6 o’clock
	Gray Scale Direction		12 o’clock
Mechanical Characteristics	DIM.	LCM (W x H x D) (mm)	40.7x54.56x3.4
	Active Area(mm)		34.848x43.56
	With /Without TSP		WITH TSP
	Weight (gram)		TBD.
	LED Numbers		3 LEDs
Electronic	Driver IC		S6D0164

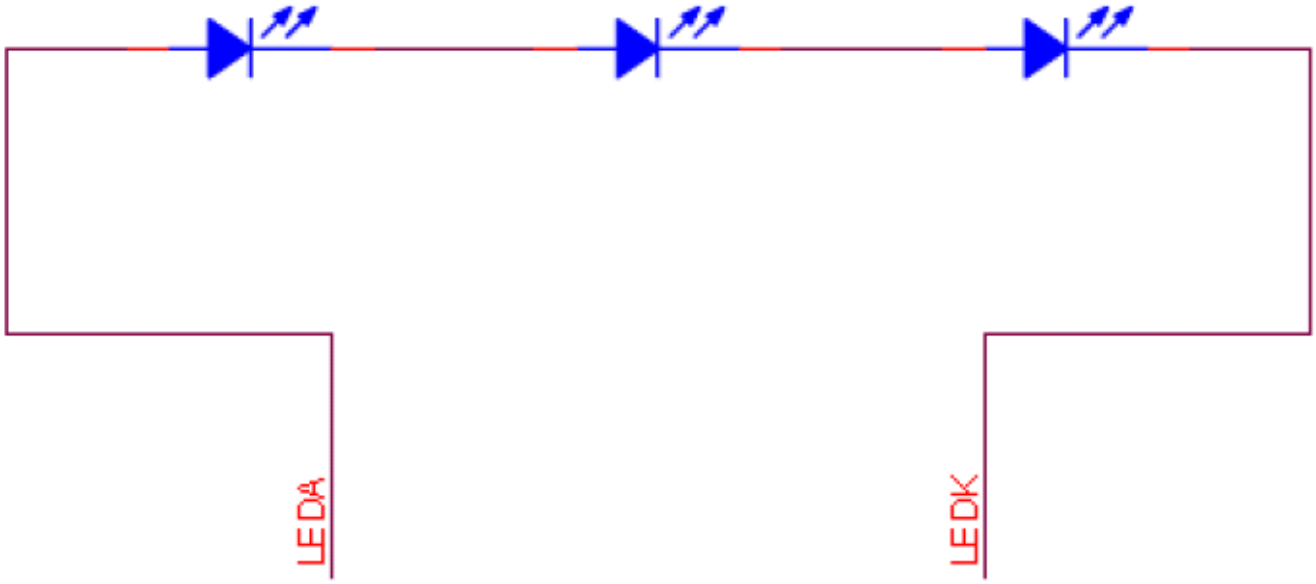
Note 1：Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

2 INPUT/OUTPUT TERMINALS

2.1 TFT LCD Panel

No	Symbol	I/O	Description	Comment
1	GND	P	Ground	
2	GND	P	Ground	
3	VCC	P	Power supply	
4	VCC	P	Power supply	
5	CS	I	Chip selection	
6	RS	I	Register select low: Index high: register	
7	/WR	I	Write signal Active low	
8	/RD	I	Read signal Active low	
9	DB0	I	Data Bus	
10	DB1	I	Data Bus	
11	DB2	I	Data Bus	
12	DB3	I	Data Bus	
13	DB4	I	Data Bus	
14	DB5	I	Data Bus	
15	DB6	I	Data Bus	
16	DB7	I	Data Bus	
17	DB8	I	Data Bus	
18	DB9	I	Data Bus	
19	DB10	I	Data Bus	
20	DB11	I	Data Bus	
21	DB12	I	Data Bus	
22	DB13	I	Data Bus	
23	DB14	I	Data Bus	
24	DB15	I	Data Bus	
25	/RESET	I	Reset signal Active low	
26	IM0	I	Mode select low :16bit high:8bit	
27	YU	O	Touch Panel signal: Top	
28	XL	O	Touch Panel signal: Left	
29	YD	O	Touch Panel signal: Down	
30	XR	O	Touch Panel signal: Right	
31	LED-A	P	Led Power	
32	LED-K	P	Led Power	

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



3 ABSOLUTE MAXIMUM RATINGS

Ta = 25℃

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VCC	-0.3	5.0	V	
Input Signal Voltage	CS,RS,WR,RD, RESET, D[0 :15]	-0.3	Vcc+0.5	V	
Back Light Forward Current	I_{LED}		25	mA	One LED
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

4 ELECTRICAL CHARACTERISTICS

4.1. Driving TFT LCD Panel

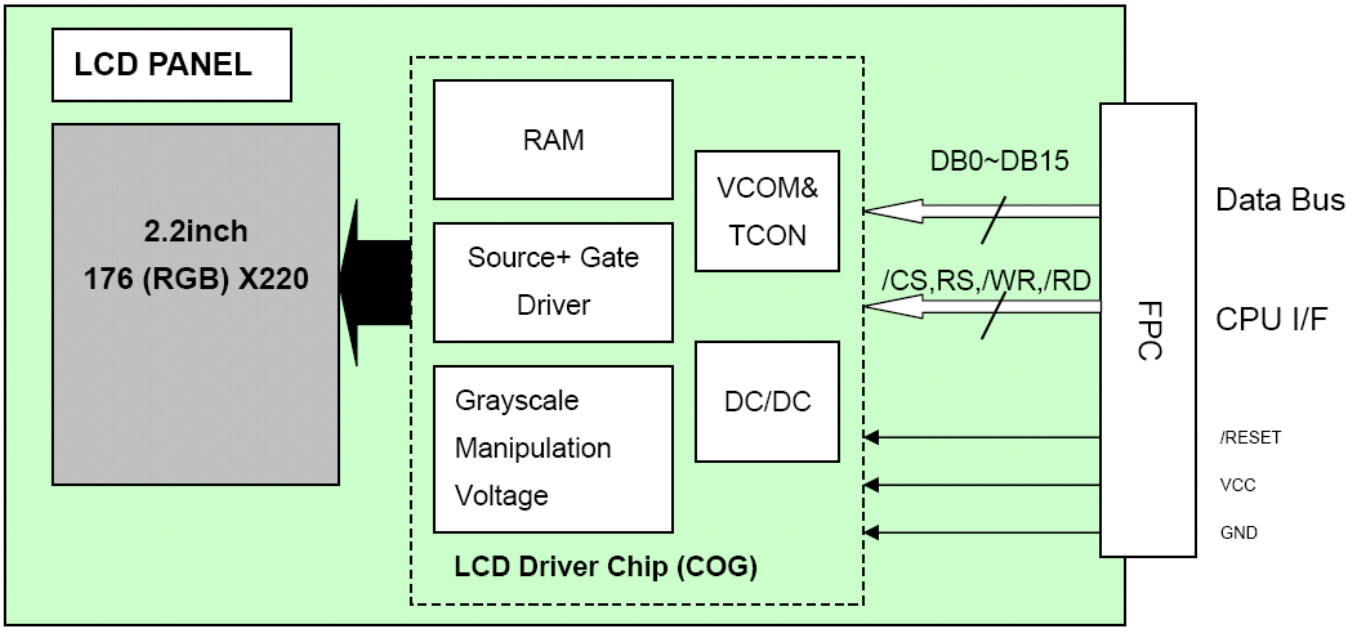
GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
supply voltage		VCC	1.65	2.8	3.3	V	
Input Signal Voltage	Low Level	V_{IL}	0		0.2*VCC	V	Input Signal Voltage
	High Level	V_{IH}	0.8*VCC		VCC	V	
Output Signal Voltage	Low Level	V_{IL}	0		0.2*VCC	V	output Signal Voltage
	High Level	V_{IH}	0.8*VCC		VCC	V	
(Panel+LSI) Power Consumption		Black Mode	TBD	TBD	TBD	mW	
		8 color Mode	TBD	TBD	TBD	mW	
		Standby Mode	TBD	TBD	TBD	mW	

4.2 Driving Backlight Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	20	--	mA	
Forward Voltage	V_F	(2.85)	3.2	(3.5)	V	
Power Consumption	W_{BL}	--	192	--	mW	

4.3. Block Diagram



5 TIMING CHART

5.1 Timing Parameter

Item		Symbol	Unit	Min	Type	Max
Bus cycle time	Write	t_{CYCW}	ns	100	—	—
Write low-level pulse width		t_{WLW}	ns	33	—	—
Write high-level pulse width		t_{WHW}	ns	33	—	—
Write rise/fall time		$t_{Wr,Wf}$	ns	—	—	25
Setup time	Write (RS~/CS,/WR)	t_{AS}	ns	10	—	—
Address hold time		t_{AH}	ns	5	—	—
Write data setup time		t_{DSW}	ns	10	—	—
Write data hold time		t_H	ns	15	—	—

Table 5.1 timing parameter

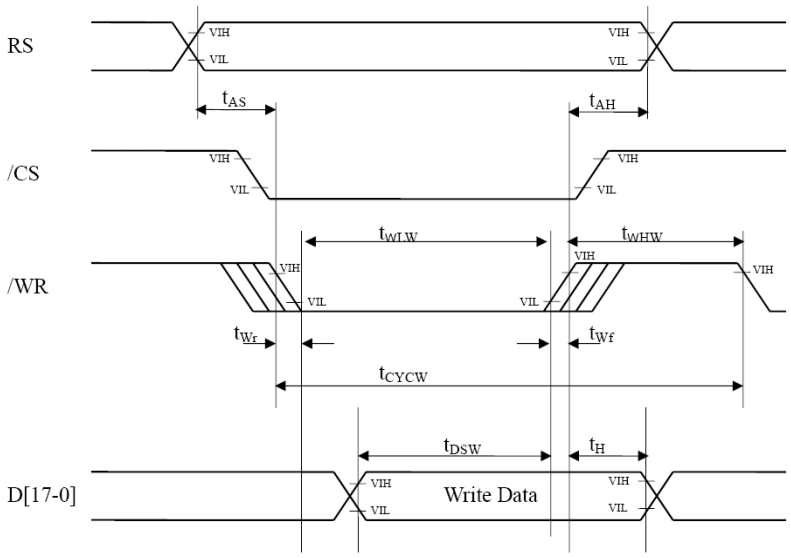
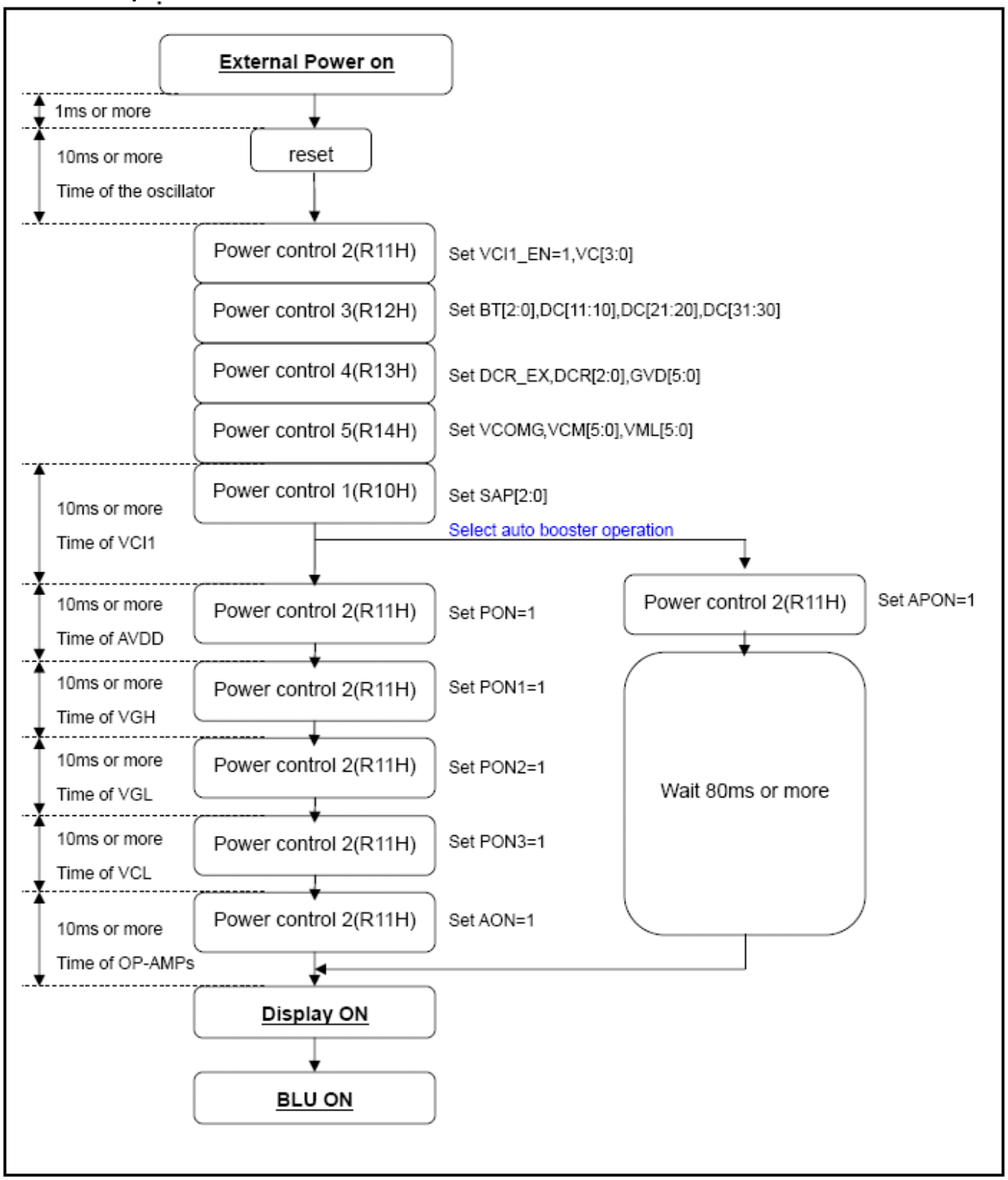


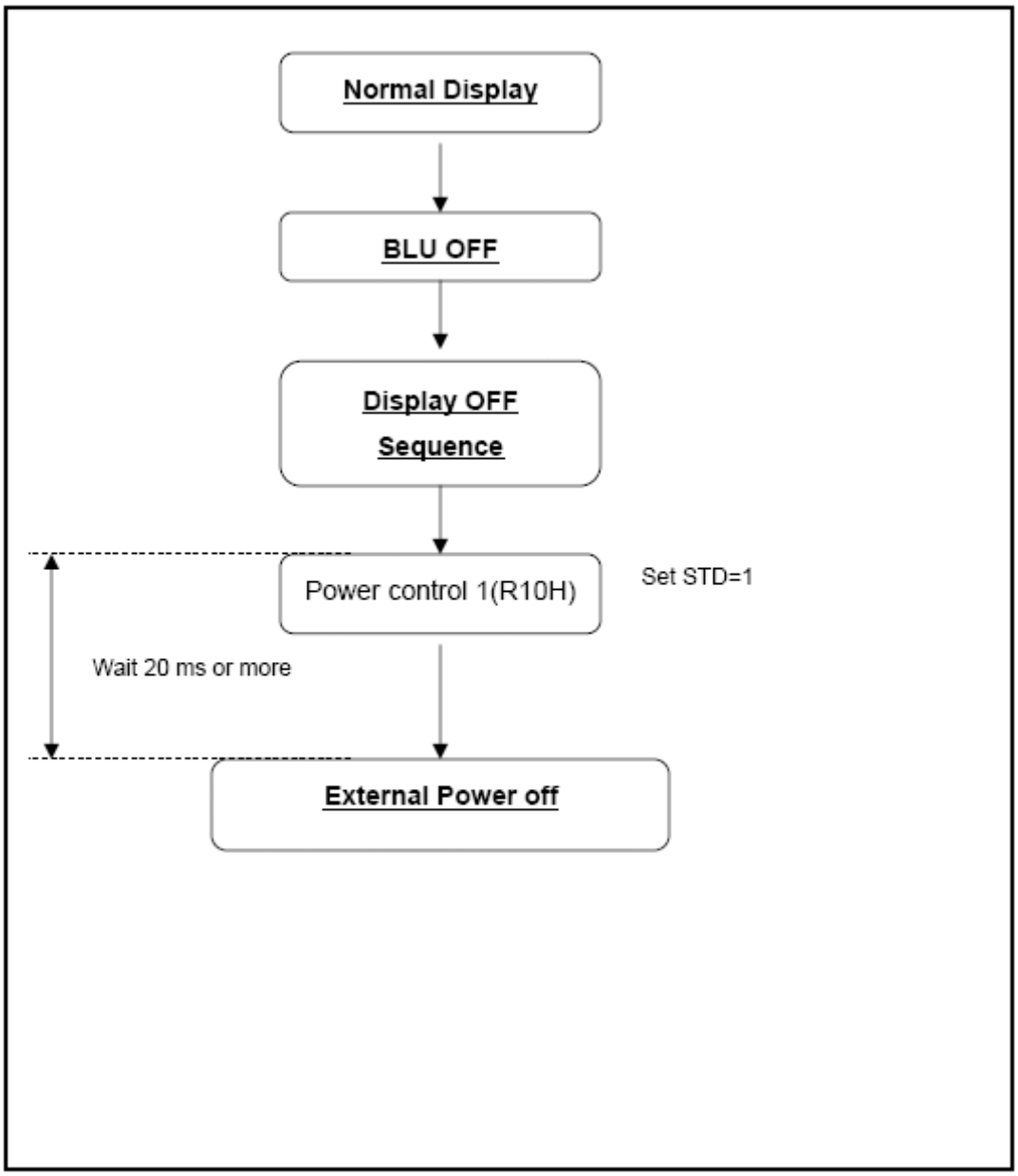
Figure 5.1: Parallel Interface Characteristics (8080-series MPU)

5.2 Power On/OFF Sequence

Power on sequence



Power off sequence



6 OPTICAL CHARACTERISTICS

6.1 Optical Specification

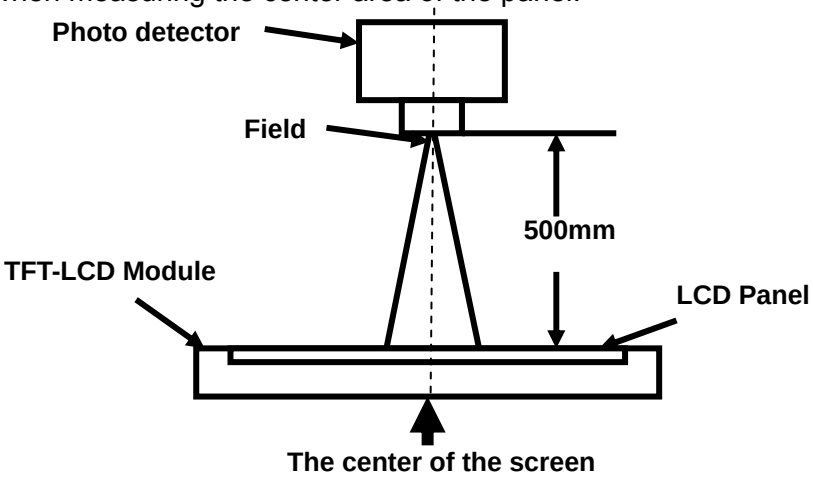
Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
View Angles		ΘU	CR≧10	35	40		Degree	Note 2
		ΘD		15	20			
		ΘL		40	45			
		θR		40	45			
Contrast Ratio		CR	θ=0°	200	350			Note3
Response Time		Tr	25℃		25	40	ms	Note4
		Tf						
Chromaticity	White	x	Brightness is on	tbd	tbd	Tbd		Note5, Note1
		y		Tbd	Tbd	Tbd		
	RED	x		Tbd	Tbd	Tbd		
		y		Tbd	Tbd	Tbd		
	GREEN	x		Tbd	Tbd	Tbd		
		y		Tbd	Tbd	Tbd		
	BLUE	x		Tbd	Tbd	Tbd		
		y		Tbd	Tbd	Tbd		
Uniformity		U		75	80		%	Note6
NTSC					（60）		%	Note 5
Luminance		L			200		cd/m^2	Note7

Test Conditions:

1. Vcc=2.8V 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	SR-3A	1°
Luminance		
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 CONOSCOPE(ergo-80)。

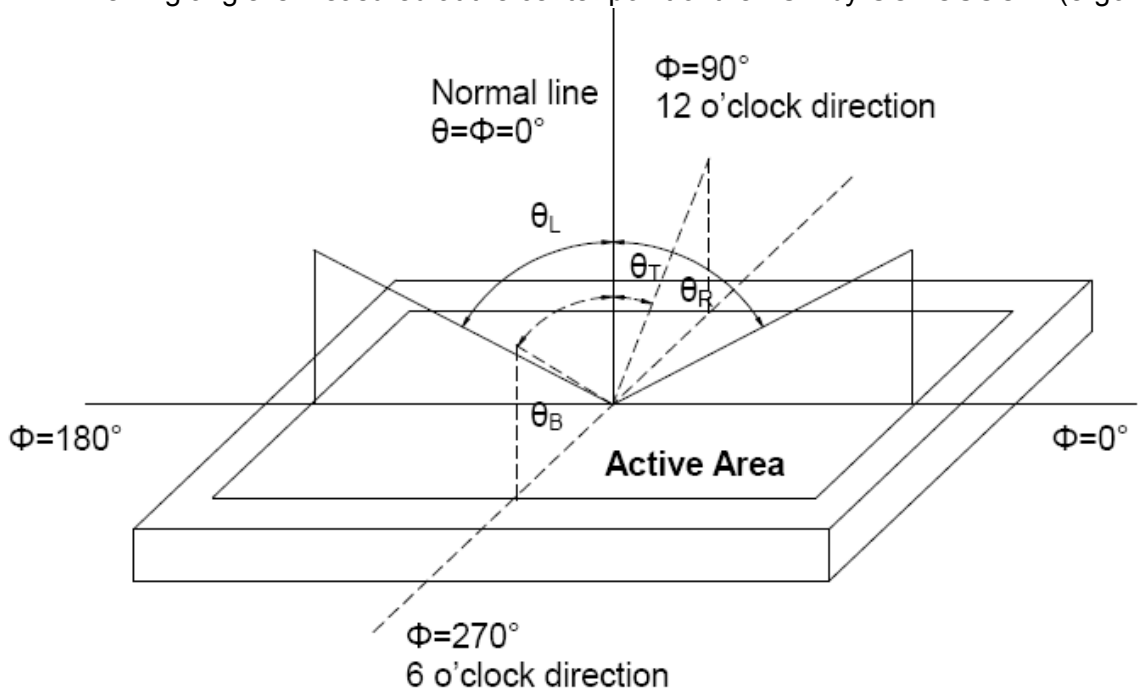


Fig. 1 Definition of viewing angle

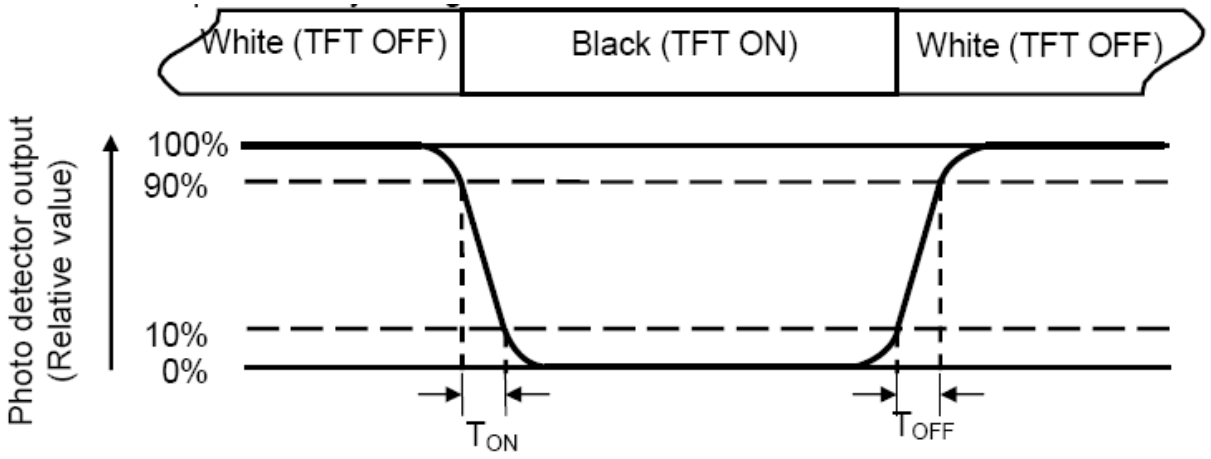
Note 3: Definition of contrast ratio

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

"White state ":The state is which the LCD is driven by **V**white.
"Black state": The state is which the LCD is driven by **V**black.
Vwhite: 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

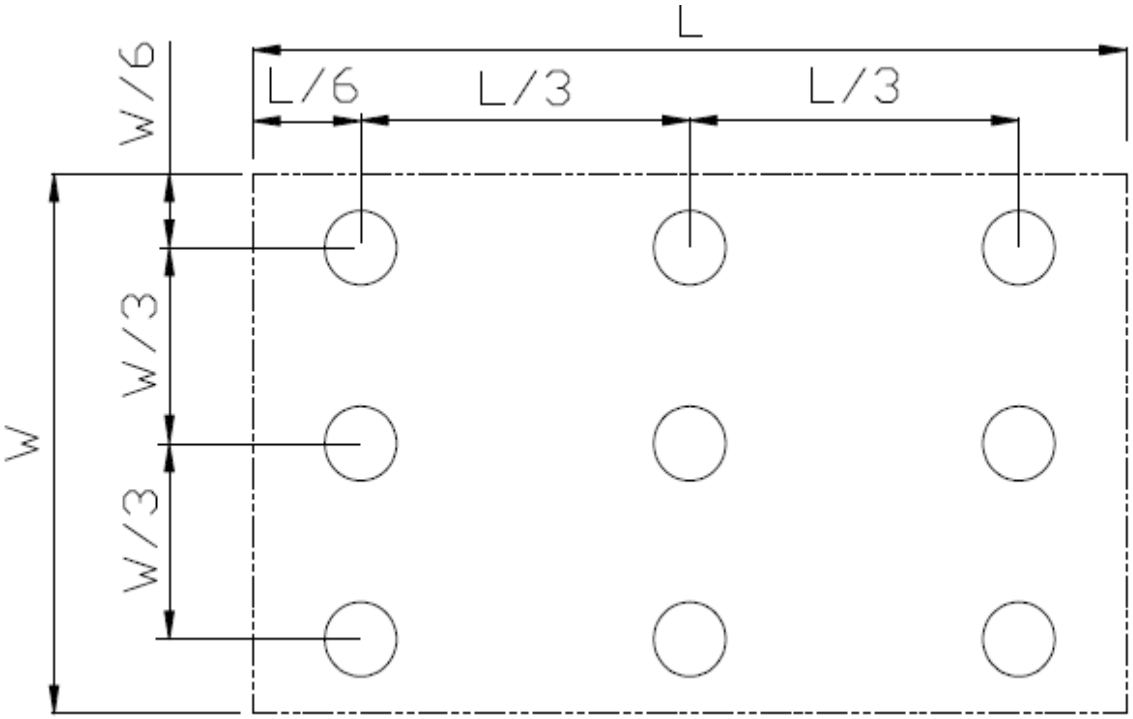


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance :

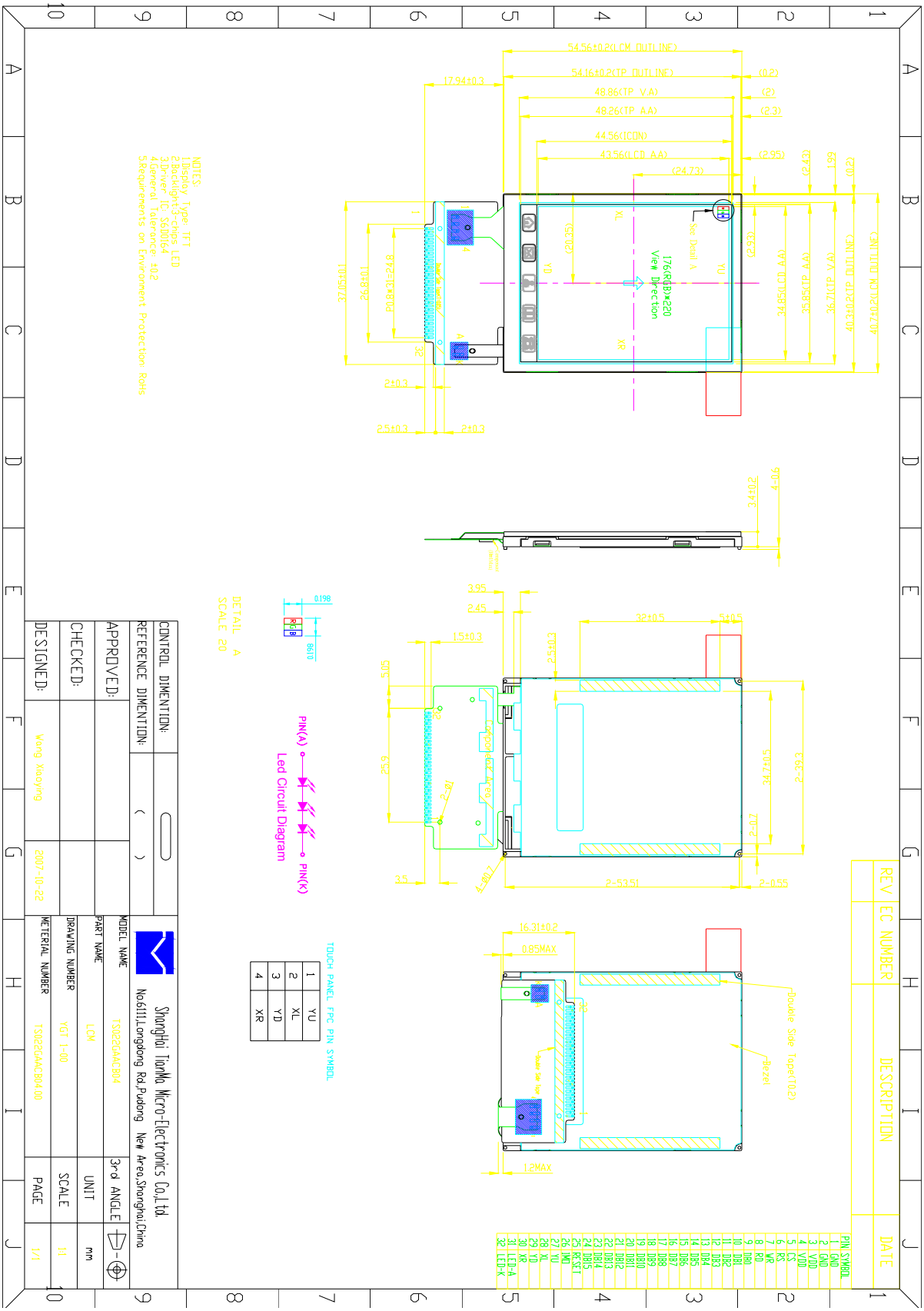
Measure the luminance of white state at center point

7 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	Note2 IEC60068-2-3, GB/T2423.3—2006
3	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1 GB2423.1—89
4	High Temperature Storage (non-operation)	Ta=+80℃, 240hrs	IEC60068-2-2, GB2423.2—89
5	Low Temperature Storage (non-operation)	Ta=-30℃, 240hrs	IEC60068-2-1 GB2423.1—89
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 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:±15KV，5times;Contact:±8KV，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.(6 hours for total)	IEC60068-2-6 GB/T2423.10—1995
9	Shock (non-operation)	60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm， 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/2423.8—1995

Note1: Ts is the temperature of panel's surface.
Note2: Ta is the ambient temperature of samples.

8 MECHANICAL DRAWING



9 Packing

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.