



MODEL NO. : TS024HAADB02
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 VERSION : Ver 1.00

- Preliminary Specification
- Final Product Specification

Customer : _____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

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This technical specification is subjected to change without notice



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Record of Revision

Rev	Issued Date	Description
0.10	2007-10-16	Preliminary release
1.00	2007-11-29	Add pacing information, add VCI voltage



GENERAL SPECIFICATIONS

Feature		Spec
Display Spec.	Size	2.4"
	Resolution	240(RGB) X 320
	Interface	CPU
	Color Depth	18bit
	Technology type	a-si TFT
	Pixel pitch (mm)	0.153x0.153
	Display colors	262k
	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)	42.72x60.26x3.2
	Active Area(mm)	36.72x48.96
	With /Without TSP	WITH TSP
	Weight (gram)	TBD.
	LED Numbers	4 LEDs
Electronic	Driver IC	ILI9325

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

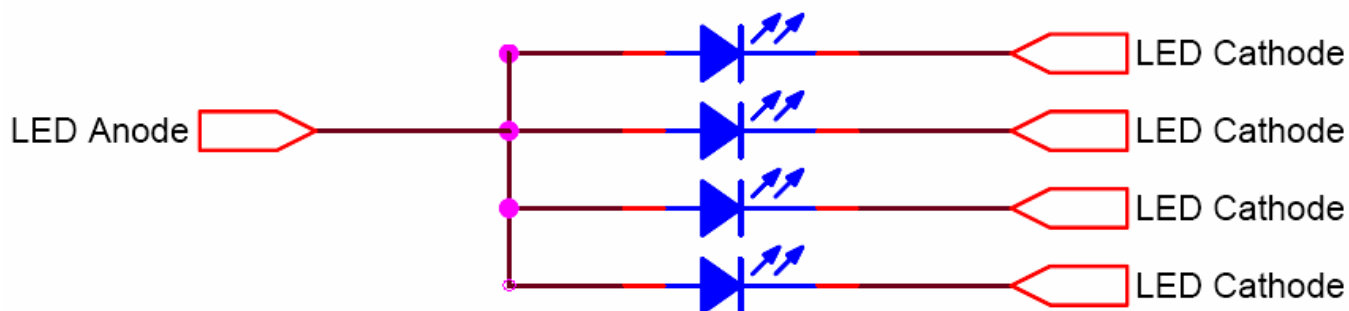
**2 INPUT/OUTPUT TERMINALS**

2.1 TFT LCD Panel

No	Symbol	I/O	Description	Comment
1	DB0	I	Data input	
2	DB1	I	Data input	
3	DB2	I	Data input	
4	DB3	I	Data input	
5	GND1	P	Power Ground	
6	VCC	P	Power Supply of Digital and Analog	
7	/CS	I	Chip select	
8	RS	I	Register select	
9	/WR	I	Write strobe	
10	/RD	I	Read strobe	
11	IM0	I	Mode select	
12	X+	O	Touch panel	
13	Y+	O	Touch panel	
14	X-	O	Touch panel	
15	Y-	O	Touch panel	
16	LED-A	P	LED anode	
17	LED-K1	P	LED cathode	
18	LED-K2	P	LED cathode	
19	LED-K3	P	LED cathode	
20	LED-K4	P	LED cathode	
21	IM3	I	Mode select	
22	DB4	I	Data input	
23	DB10	I	Data input	
24	DB11	I	Data input	
25	DB12	I	Data input	
26	DB13	I	Data input	
27	DB14	I	Data input	
28	DB15	I	Data input	
29	DB16	I	Data input	
30	DB17	I	Data input	
31	/Reset	I	Reset	
32	VCI	P	Power Supply of Digital and Analog	
33	VCC	P	Power Supply of Digital and Analog	
34	GND	P	Power Ground	
35	DB5	I	Data input	
36	DB6	I	Data input	
37	DB7	I	Data input	



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



3 ABSOLUTE MAXIMUM RATINGS

Ta = 25°C

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VCC	-0.3	4.6	V	
Input Signal Voltage	CS,RS,WR,RD, RESET, D[0 :15]	-0.3	4.6	V	
Back Light Forward Current	I _{LED}		25	mA	One LED
Operating Temperature	T _{OPR}	-20	70	°C	
Storage Temperature	T _{STG}	-30	80	°C	

**4 ELECTRICAL CHARACTERISTICS**

4.1. Driving TFT LCD Panel

GND=0V, Ta=25°C

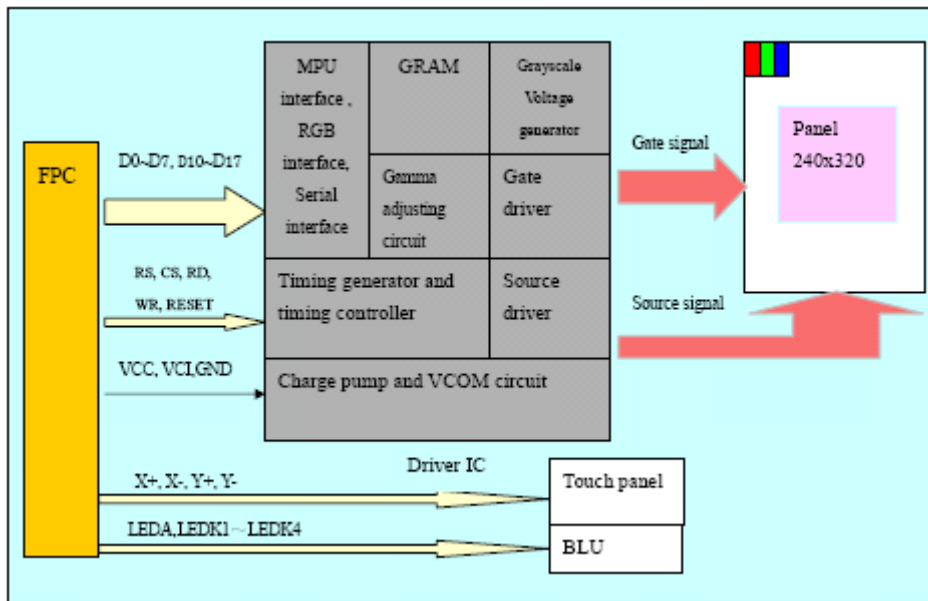
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply voltage	V _{CI}	2.5	2.8	3.3		
supply voltage	V _{CC}	1.65	2.8	3.3	V	
Input Signal Voltage	Low Level	V _{IL}	0	0.2*V _{CC}	V	Input Signal Voltage
	High Level	V _{IH}	0.8*V _{CC}	V _{CC}	V	
Output Signal Voltage	Low Level	V _{IL}	0	0.2*V _{CC}	V	output Signal Voltage
	High Level	V _{IH}	0.8*V _{CC}	V _{CC}	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°C

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}	--	256	--	mW	



4.3. Block Diagram





5 TIMING CHART

Item	Symbol	Unit	Min.	Typ.	Max.	Remark
Bus cycle time	Write	t_{CYCW}	ns	100	-	-
	Read	t_{CYCR}	ns	300	-	-
Write low-level pulse width	PW_{LW}	ns	50	-	500	
Write high-level pulse width	PW_{HW}	ns	50	-	-	
Read low-level pulse width	PW_{LR}	ns	150	-	-	
Read high-level pulse width	PW_{HR}	ns	150	-	-	
Write / Read rise / fall time	t_{WR}/t_{WRf}	ns	-	-	25	
Setup time	Write (RS to nCS, E/nWR)	t_{AS}	ns	10	-	-
	Read (RS to nCS, RW/nRD)			5	-	-
Address hold time	t_{AH}	ns	5	-	-	
Write data set up time	t_{DSW}	ns	10	-	-	
Write data hold time	t_H	ns	15	-	-	
Read data delay time	t_{DDR}	ns	-	-	100	
Read data hold time	t_{DHR}	ns	5	-	-	

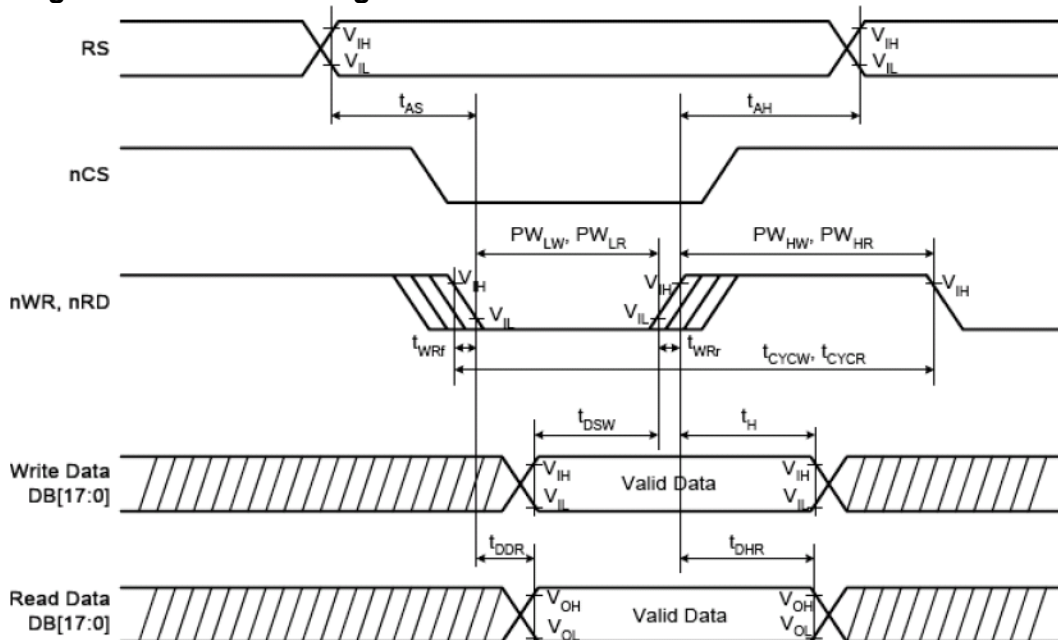
Reset Timing Characteristics

Ta=25°C

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	t_{RES}	ms	1	-	-
Reset rise time	t_{rRES}	μs	-	-	10



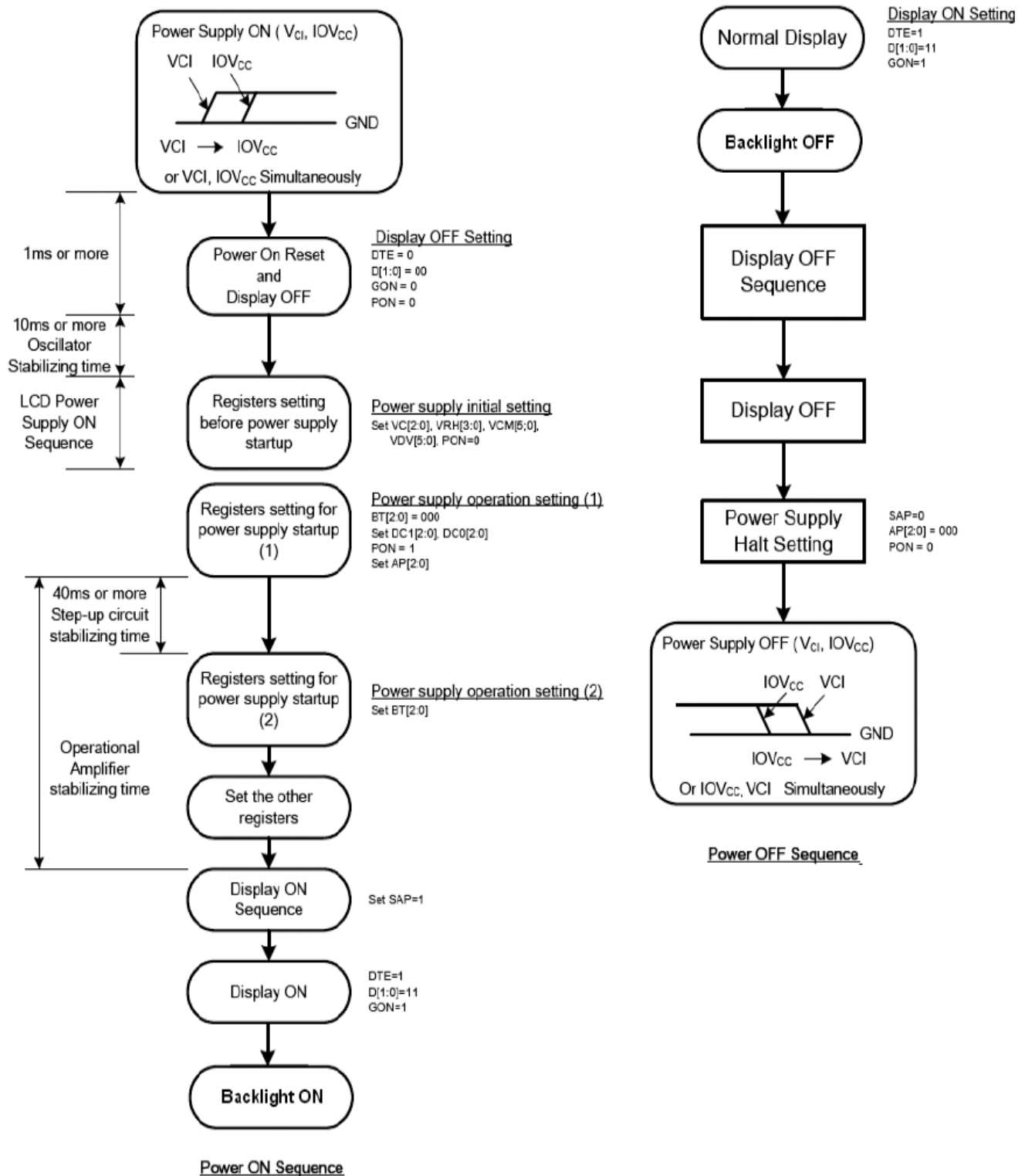
Register read/write timing:





5.2 Power On/OFF Sequence

Refer to the ILI9325 datasheet for more details





6 OPTICAL CHARACTERISTICS

6.1 Optical Specification

Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
View Angles	θU	$CR \geq 10$	55	60		Degree	Note 2
	θD		50	55			
	θL		55	60			
	θR		55	60			
Contrast Ratio	CR	$\theta = 0^\circ$		350			Note3
Response Time	Tr	25°C		25	40	ms	Note4
	Tf						
Chromaticity	White	x	Brightness is on		TBD		Note5, Note1
		y			TBD		
	RED	x			TBD		
		y			TBD		
	GREEN	x			TBD		
		y			TBD		
	BLUE	x			TBD		
		y			TBD		
Uniformity	U			80		%	Note6
NTSC				(60)		%	Note 5
Luminance	L			(200)		cd/m ²	Note7

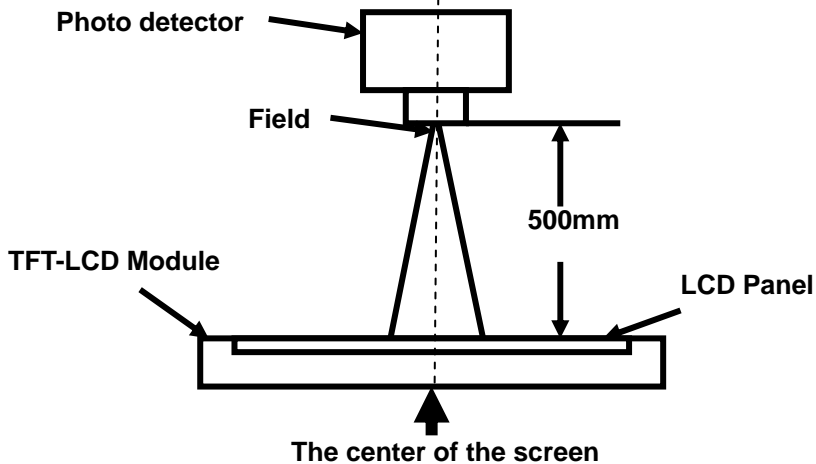
Test Conditions:

1. Vcc=2.8V $I_L = 20\text{mA}$ (Backlight current), the ambient temperature is 25°C.
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).

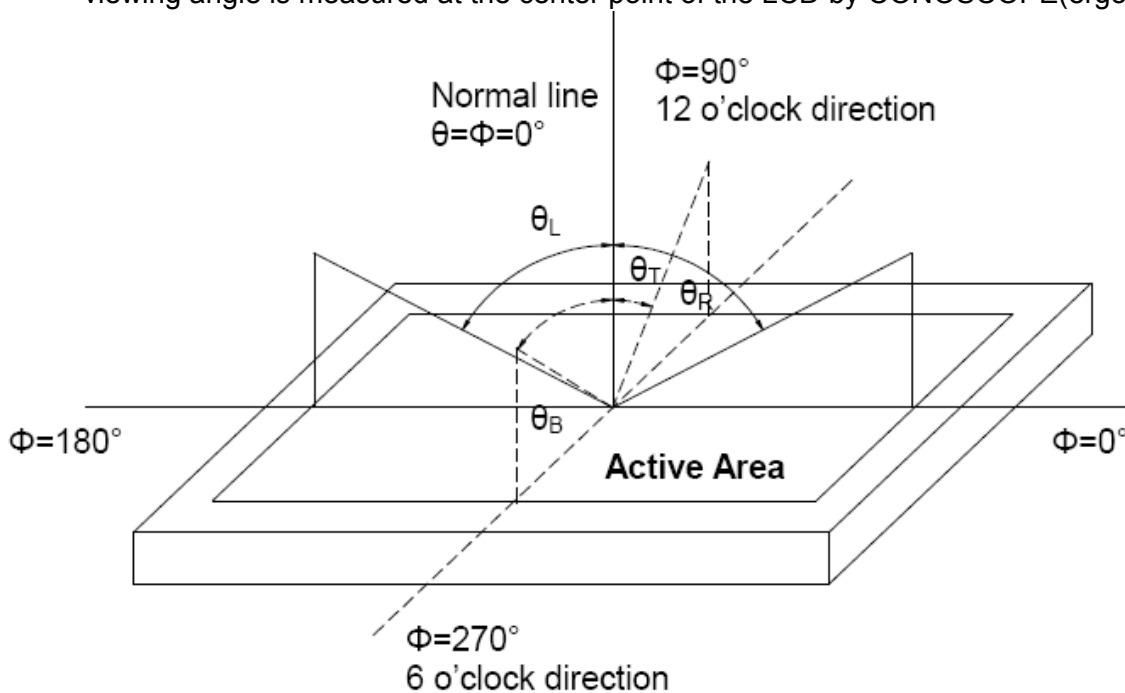


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

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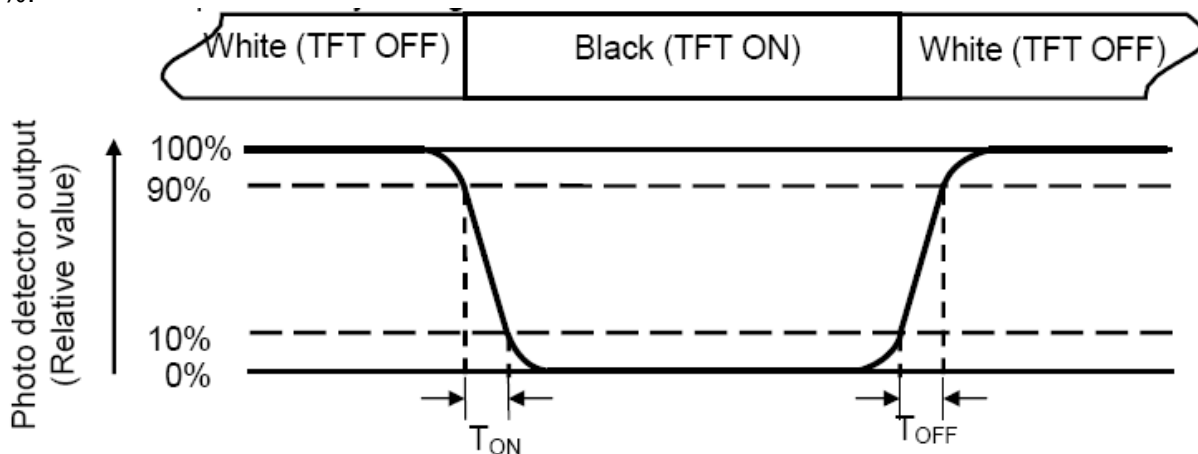
“White state “:The state is which the LCD is driven by V_{white} .

“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 (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

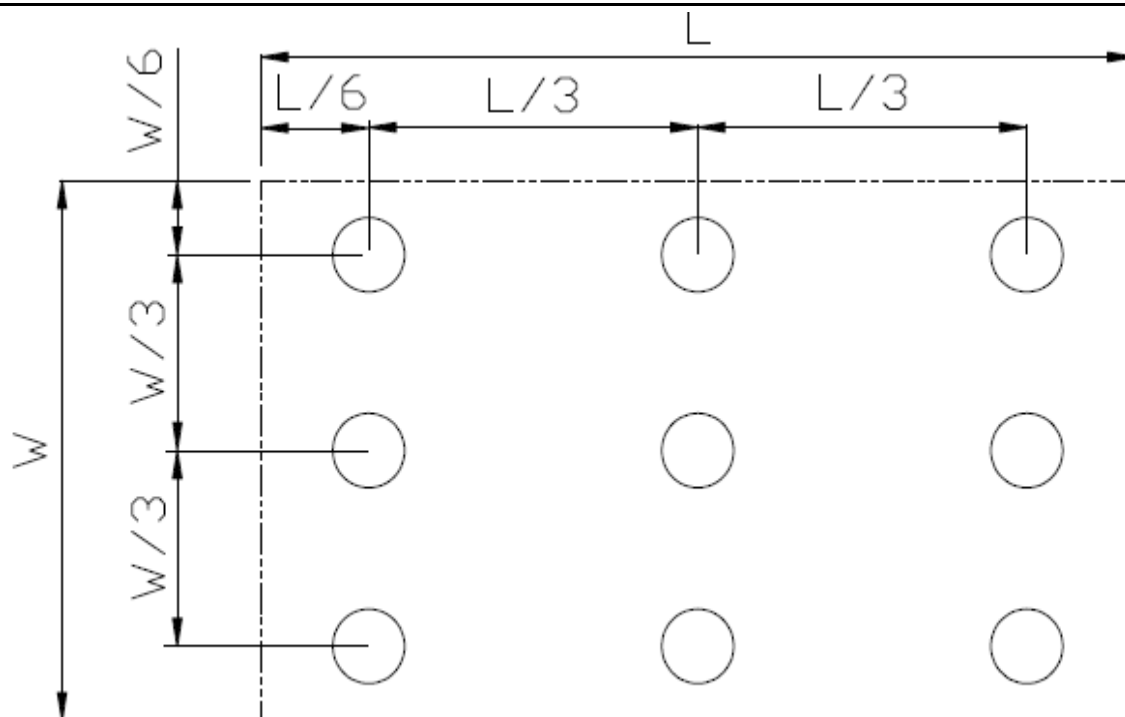


Fig. 2 Definition of uniformity

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 Tests

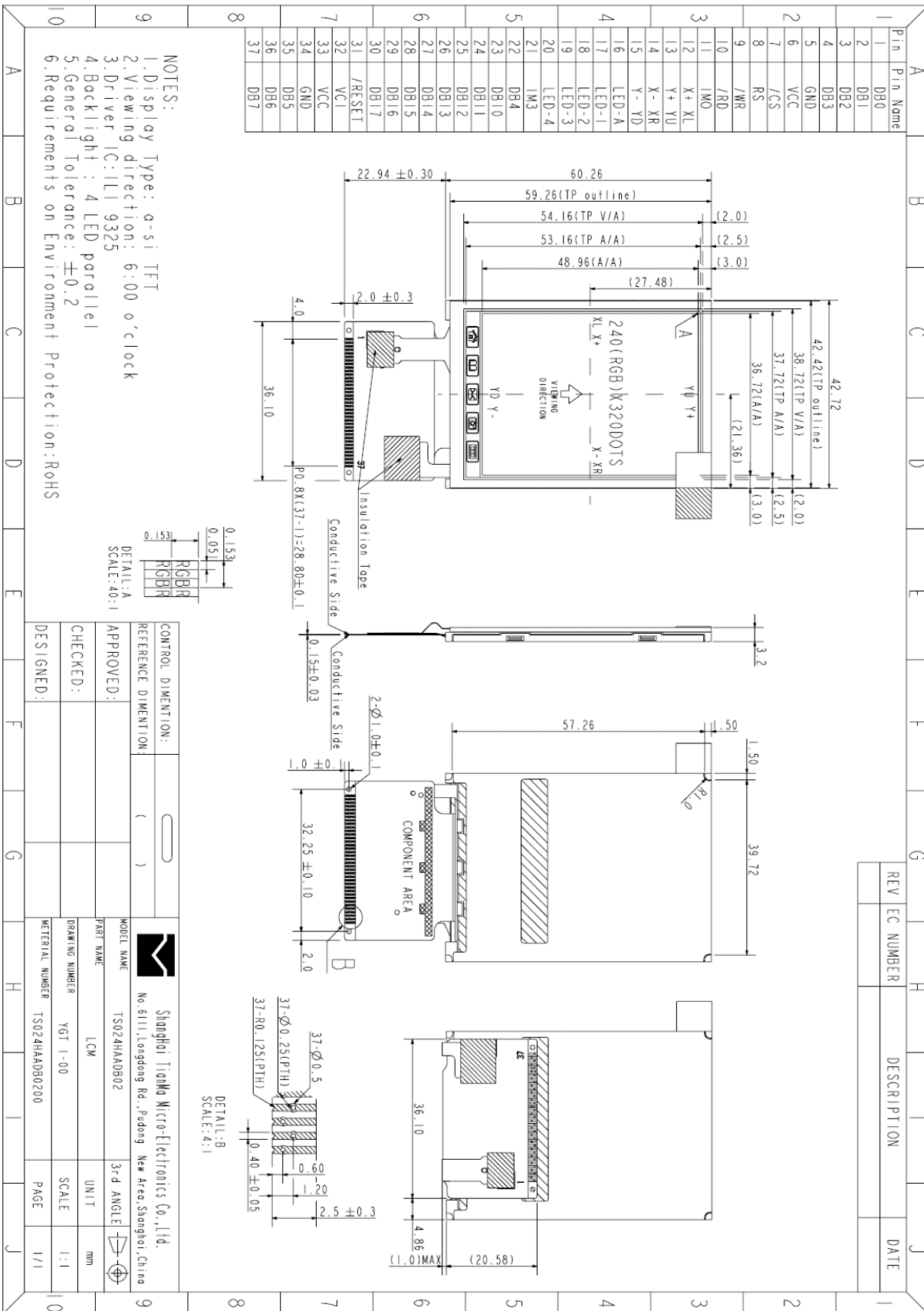
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 IEC60068-2-2,GB2423.2—89
2	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	Note2 IEC60068-2-3, GB/T2423.3—2006
3	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1 GB2423.1—89
4	High Temperature 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 di- rection	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





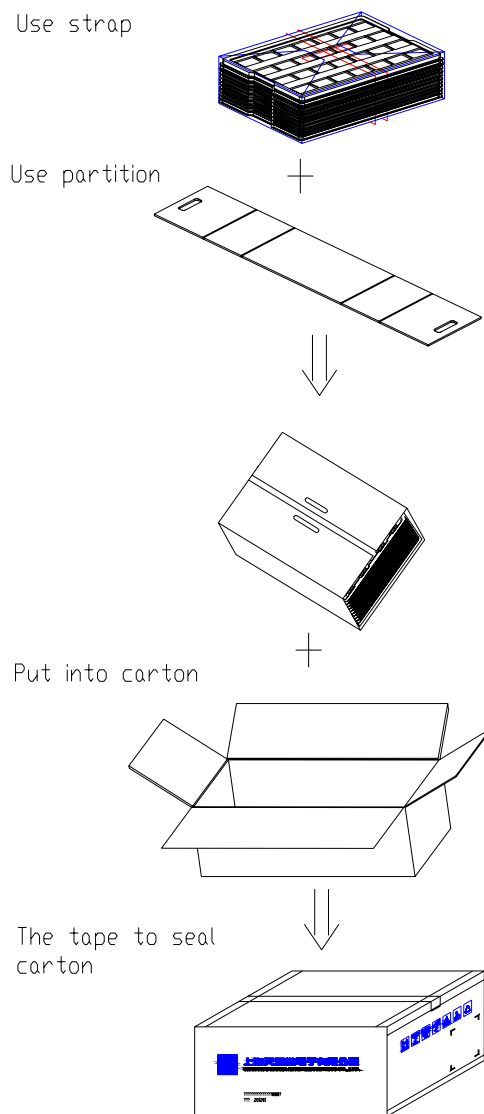
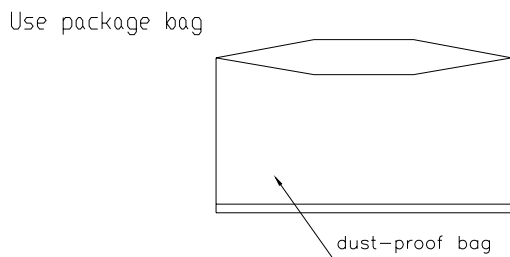
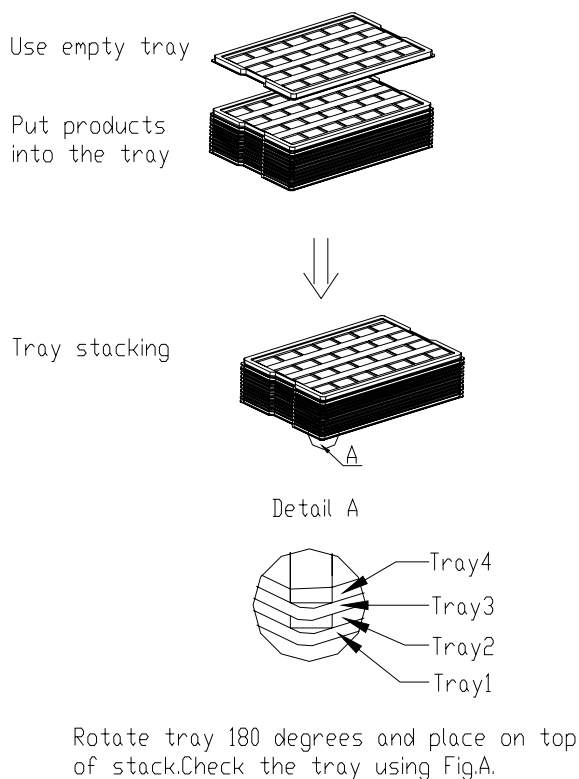
9 Packing

Package Quantity:

One Tray Include: 28 Pcs Module

One package: 22Pcs Tray(21Tray+1Empty Tray)

One Carton Include: 28X21=588 Pcs Module





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°C ~ 40°C 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.